AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

SEPTEMBER 15, 1958

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Die Casting Cylinder Blocks for 50-Hp Engines
Mechanical Details of Chrysler Corp's 1959 Cars
Making Transmission Parts at Ford's Livonia Plant
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Trends in Use of Selected Equipment in Automobiles
Automatic Testing of Air Suspension Components

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A CHILTON PUBLICATION

it's mainly a matter of TIMING!

When you replace a machine at the RIGHT TIME, it's the most profitable investment you can make

WHAT is the retirement age of a machine tool? Unfortunately, there's only one answer — "It depends." And it depends on so many things that there's a temptation to by-pass the precise computations and use some general approximations or rule-of-thumb estimates.

The temptation can be *costly*. For there's only one *right time* to replace a machine. A time when production cost, payoff time and carrying charges will result in the minimum net investment for your company. Too early is as bad as too late. Either way, you lose money.

If you are looking for ways to improve the profit picture, now is the time to take a good look at your replacement schedule. If the time is right, an investment in a new machine will yield a bigger return than any other investment you can make.

Heald engineers are well experienced in making obsolescence studies. And their specialized know-how in this field is available to you at any time — to help you save money by a properly timed replacement program. Similar studies by Heald engineers have pointed the way to many important cost savings.

For example: A manufacturer of centrifugal pumps had been using a Model 48A Heald Bore-Matic (1946 vintage) to bore, turn and face miscellaneous pump parts. Could it be "retired" at a *profit?* To answer the question, a cost analysis was made, in comparison with a new Heald Model 321 Bore-Matic. Based on the figures shown below, the replacement *was* made — and at a saving of $6,335 a year!

	Old Machine	New Machine
Direct and Indirect Labor, per year	$21,550	$17,230
Scrap Losses	1,803	263
Annual Maintenance	695	220
Annual Operating Cost	$24,048	$17,713
Annual Saving for New Machine		$ 6,335

YOU pay for obsolescence. Replacement pays for itself!

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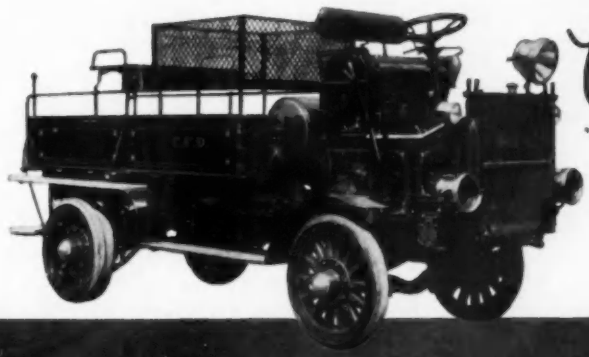

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

SEPTEMBER 15, 1958 — VOL. 119, NO. 6

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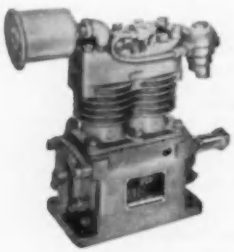

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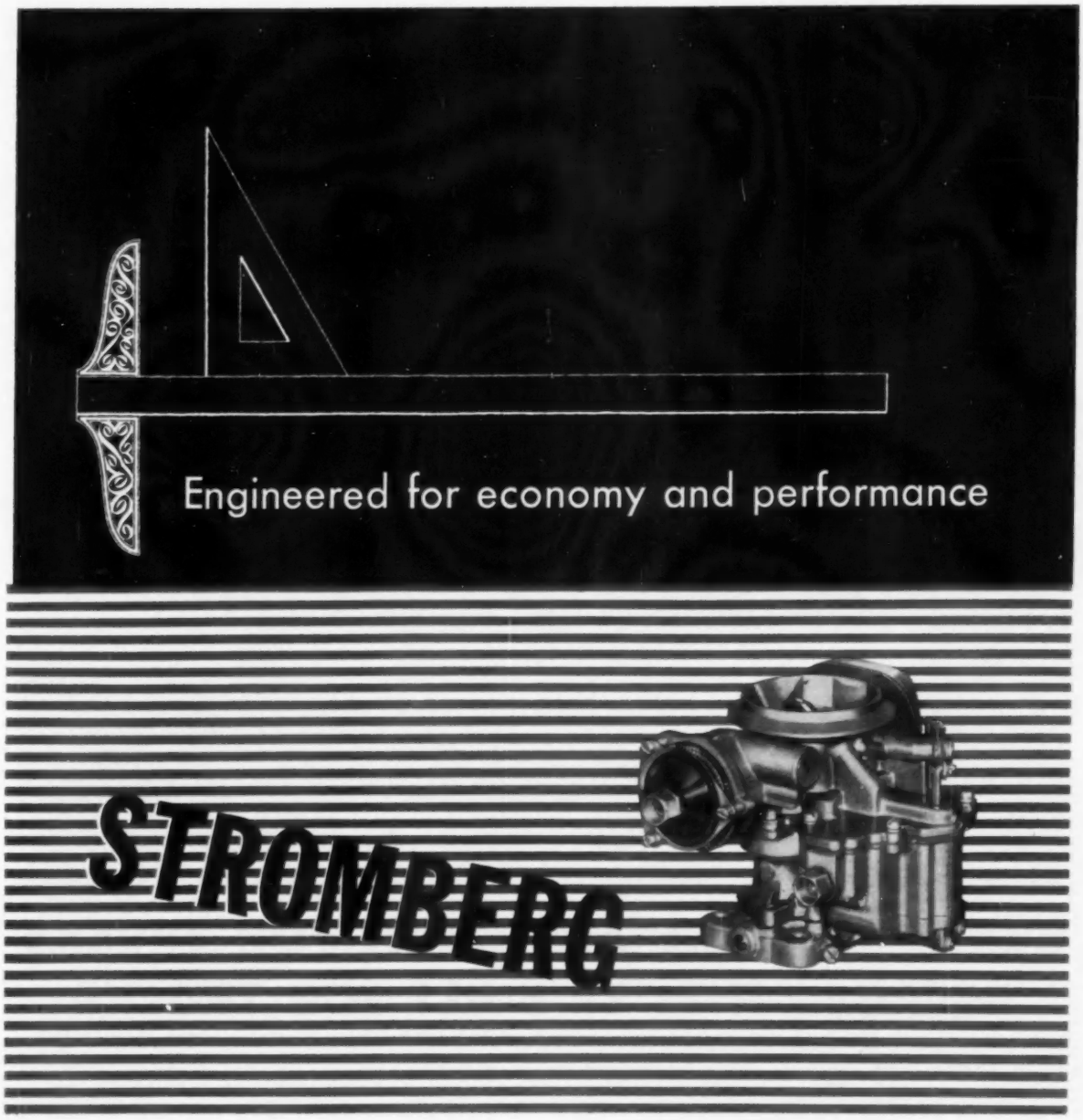

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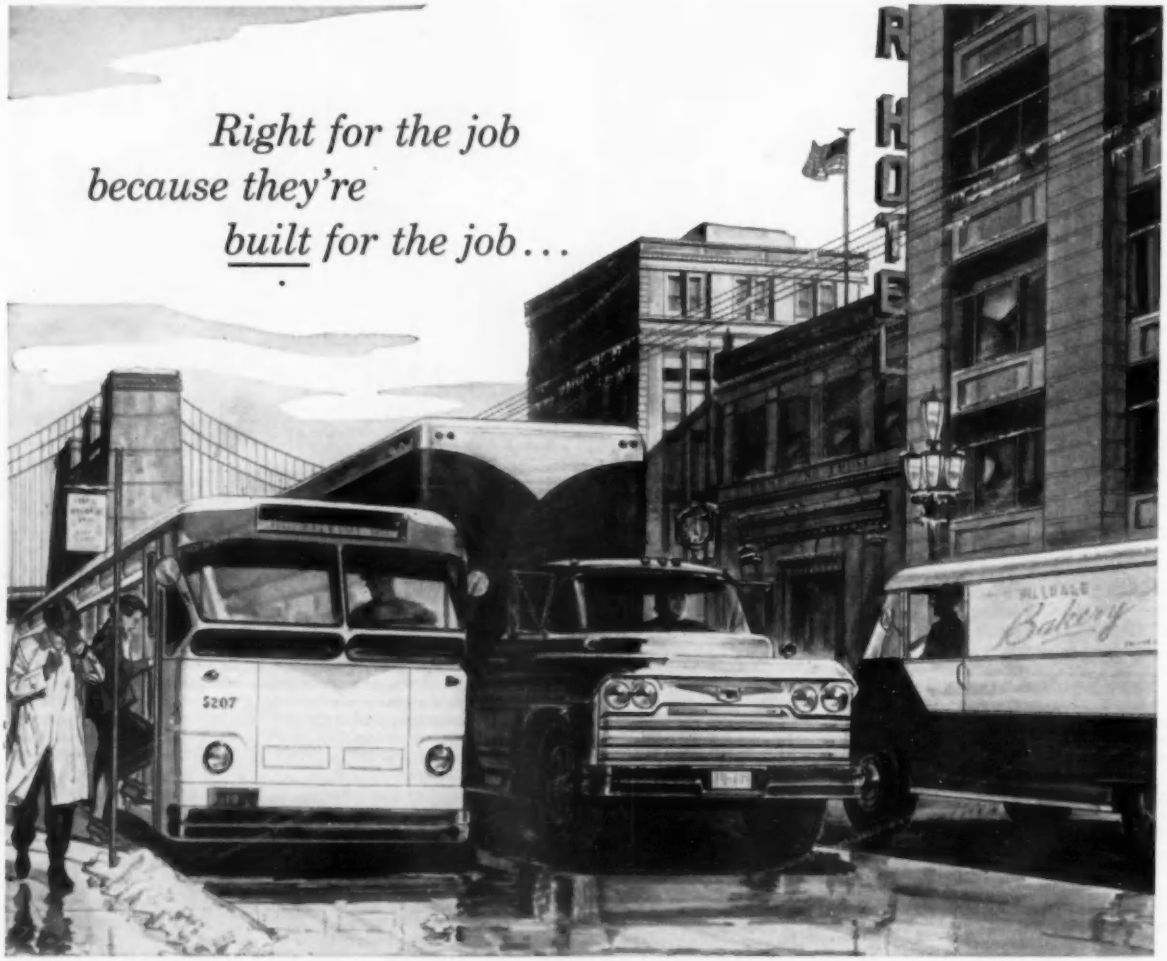

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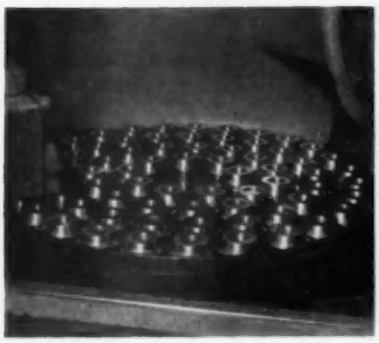
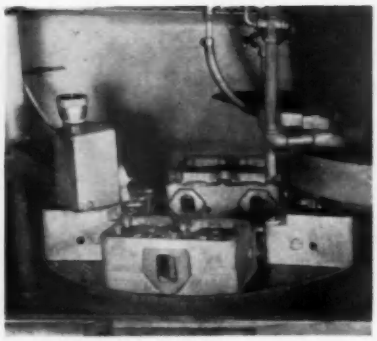


200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits ± .001".



Tops of cylinder heads ground 21 per hour; stock removal 3/16" to 1/4". Bottoms 55 per hour; stock .012"; limits ± .001".

56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

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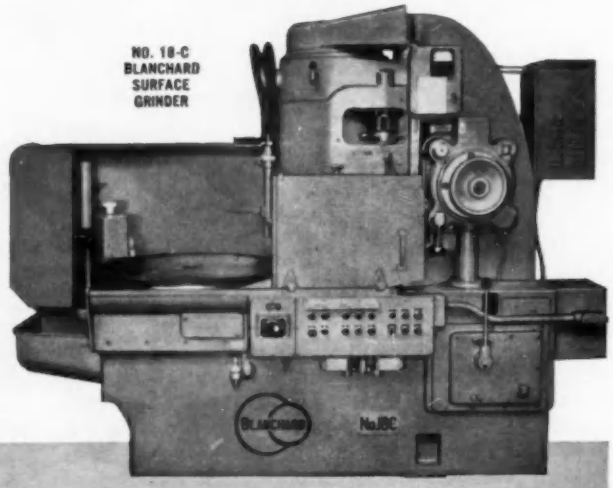
The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



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Moves chuck to grinding position and starts it rotating

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Changes to fine feed just before finished size is reached

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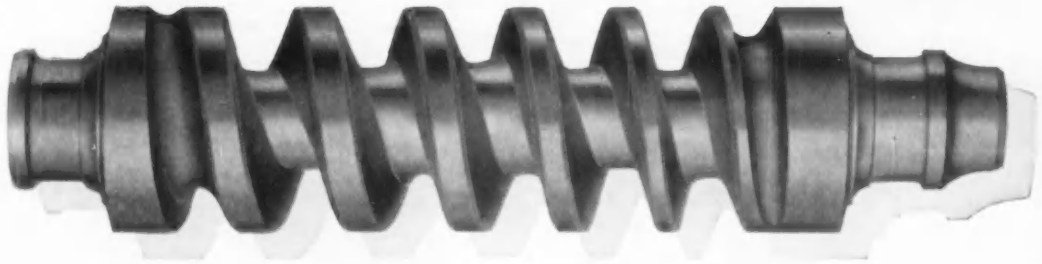
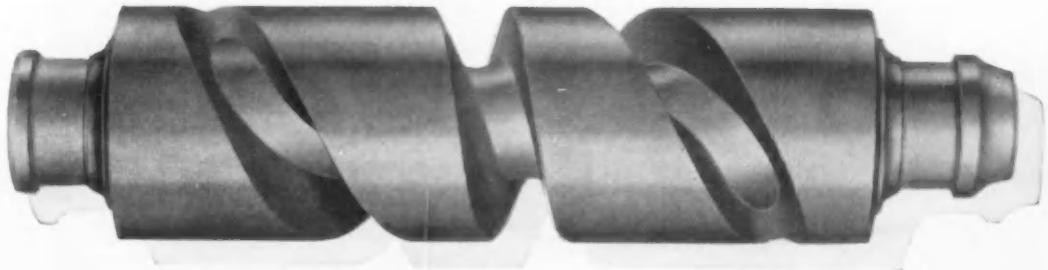


Constant ratio 22:22:22 . . . 22 to 1 ratio for cornering and 22 to 1 for straight-ahead driving . . . 5 turns of steering wheel from lock to lock.

Variable ratio 12:20:12 . . . 12 to 1 ratio for cornering and 20 to 1 for straight-ahead handling . . . 3 turns of wheel from lock to lock.



. . . Constant Ratio and Variable Ratio

Ross

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Passenger Cars	Farm Machinery
Trucks, Buses	Industrial Equipment

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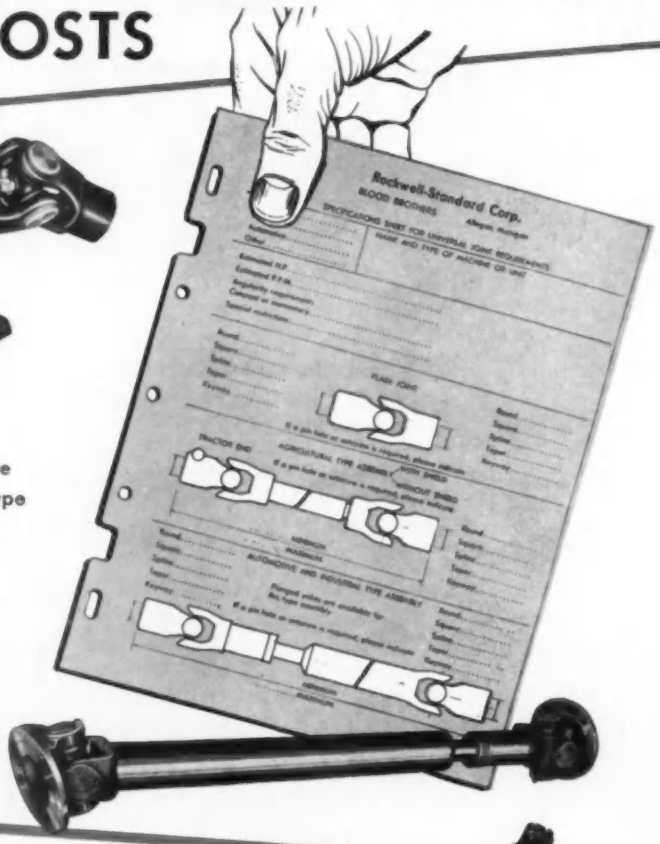

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AND DRIVE LINE
ASSEMBLIES

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It's the kind of job your Denison Hydraulic Specialist can help *you* do now. Ask him more about how Denison 2000 psi Pumps can *improve performance of your equipment.*

DESIGNERS — ENGINEERS!

Write for your copy of Bulletins 200 and 201 "How to Design More Efficient Hydraulic Power Into Mobile Machinery" and "Balanced Vane 2000 psi Hydraulic Pumps."

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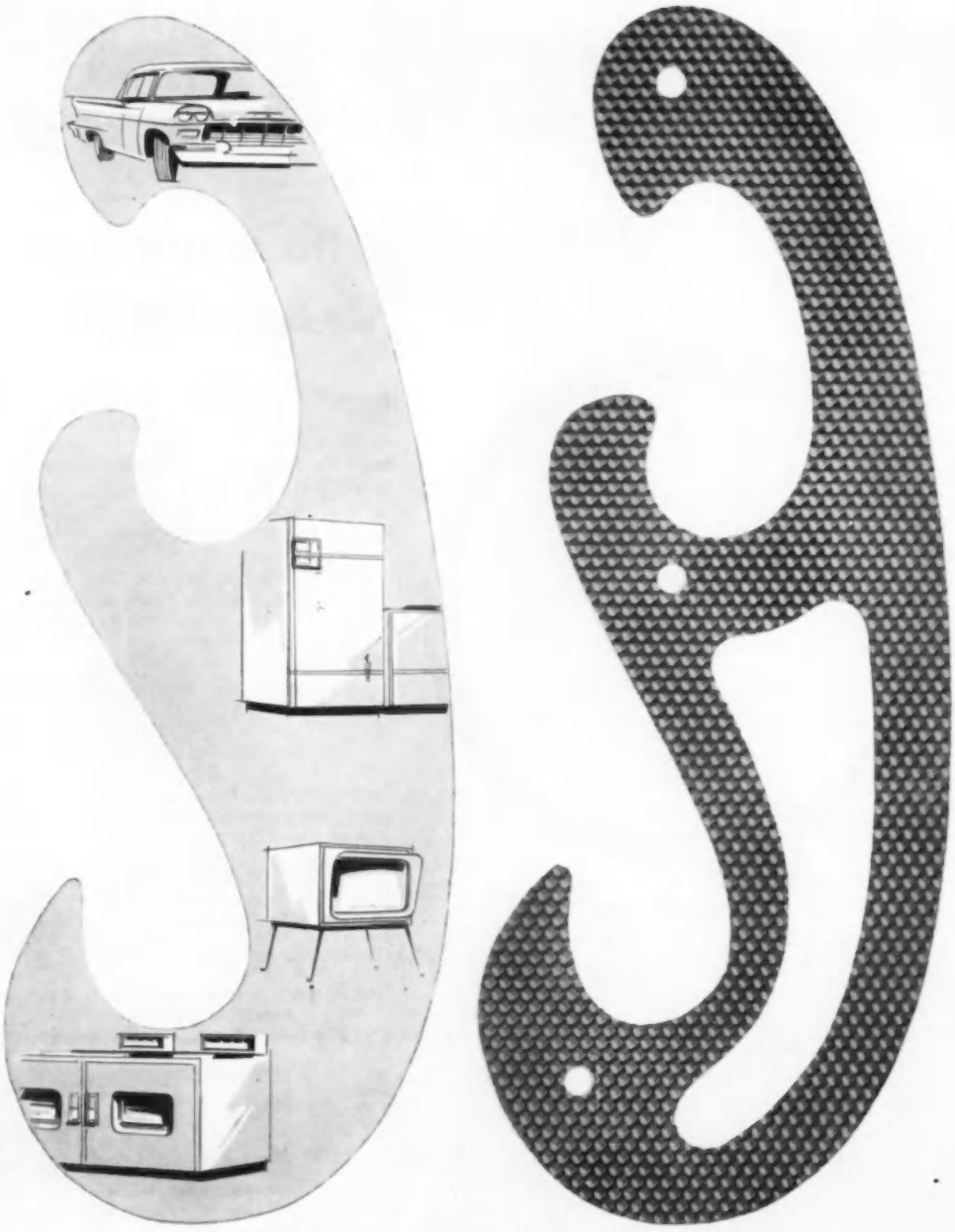

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Count on Firestone production to solve your biggest problems with colorful, low-cost, mass produced trim for automotive products and home appliances.

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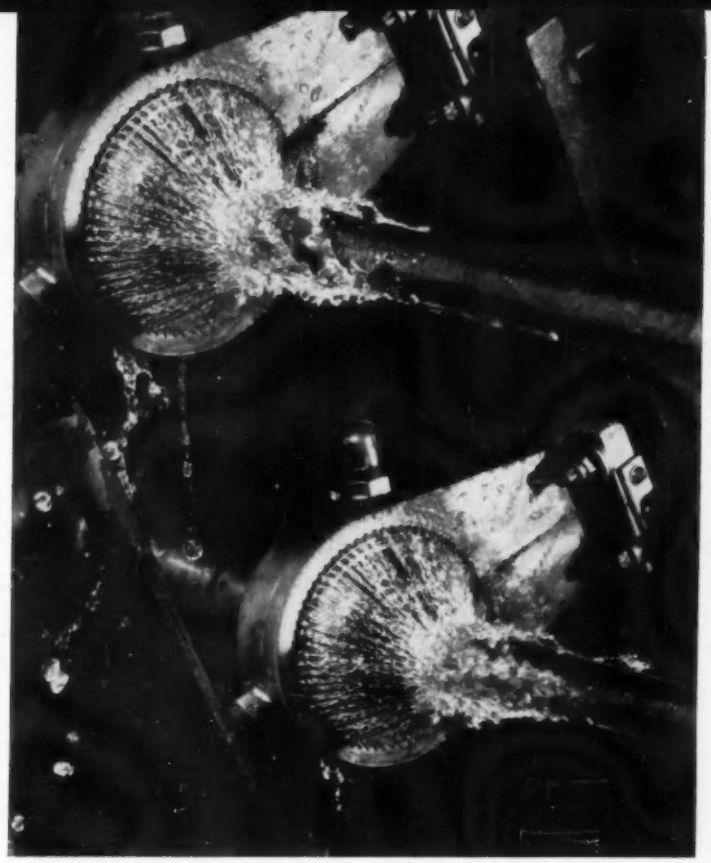
FIRESTONE STEEL PRODUCTS COMPANY
AKRON 1, OHIO

How Westinghouse Induction Heating Saved . $152,880

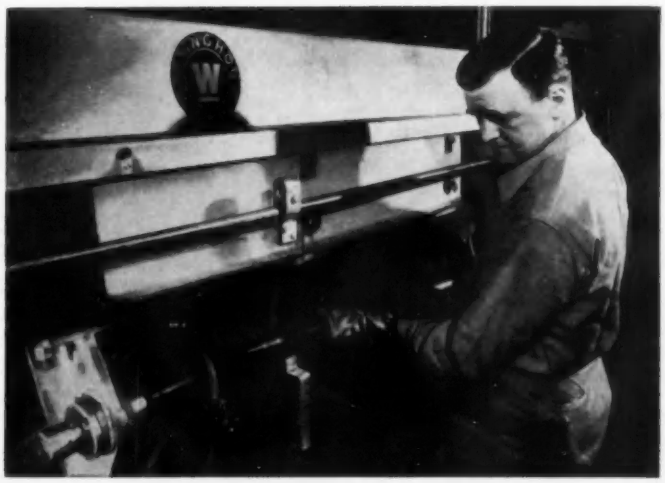


Here is how Hightower-Morse & Company is successfully meeting the cost-price squeeze with Westinghouse Induction Heating. In the horizontal hardening of automotive axles, this progressive manufacturer found it imperative to invest in modern equipment to produce an improved product and hold the price to customers at a reasonable level. Here are the facts:

	SAVING PER AXLE
1046 carbon steel replaces costly 4145 alloy steel, yet scores high Rockwell hardness and greater toughness	75¢
Eliminates a stress-relief operation	13¢
Previously, all axles were hardness-tested; now necessary to spot-test only 3%	5¢
Hobbing machine cutters last longer	3¢
Drills last longer	1/3¢
Lathe tools last longer	1/5¢
Increases production because of less down time for changing cutting tools	1-9/10¢

Another saving—gas furnaces must run 24 hours a day at estimated $10 per-hour fuel cost, but Westinghouse Induction Heating uses current only when work is going through; electricity costs $3.50 per hour.

What's your problem—rejects, high costs, quality control? Your Westinghouse Induction Heating specialist can suggest applications in your plant for Westinghouse integrated production-line equipment.



Axles pass through coils of Westinghouse horizontal scanner two at a time at Hightower-Morse & Company. This one-man operation requires 60% less space than furnace heating; gives exact control of temperature and quench.

J-35005-R

NEW—from Westinghouse Engineering and Development—LOW DISTORTION Induction Hardening Machine. It combines hardening, drawing and distortion reduction in one operation. Ask your Westinghouse specialist for complete information.

YOU CAN BE SURE...IF IT'S Westinghouse

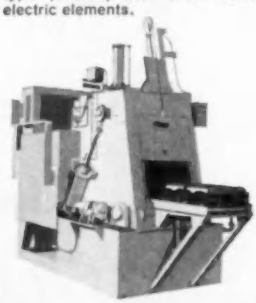
Wherever industry needs heat...

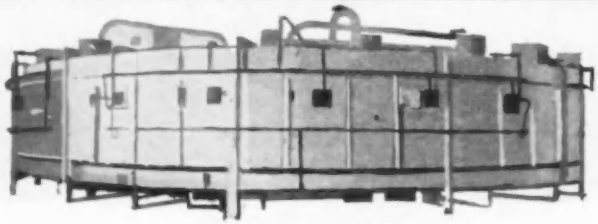
You'll find *LINDBERG* equipment just right for the specific job

Pilot Plant Equipment: Atmosphere tube unit (shown) for processing work at temperatures to 2200° F.

Roller Hearth Furnaces: Continuous electric type (shown) with temperature range 1300° to 2100° F.

Automatic Carbonitriding Furnaces: Automated integral quench type (shown) with CORRTHERM electric elements.



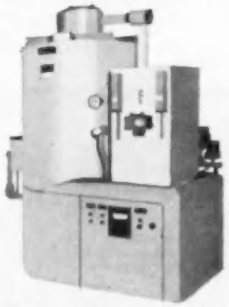


Rotary Hearth Furnaces: Doughnut type field-installed gas-fired furnace (shown) with capacity of 13,000 lbs. per hour.

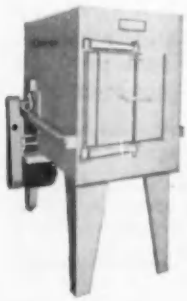
Vertical Type Furnaces: Carburizing and hardening furnace (shown) with CORRTHERM electrical heating elements.

HF Induction Heating Units: Available in 5, 10, 25 and 50 KW units.

Ceramic Kilns: Gas-fired periodic kiln (shown) with temperature range to 3250° F.



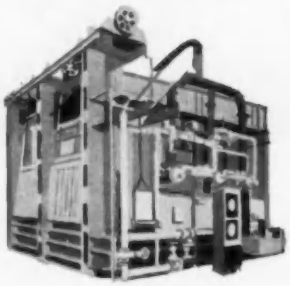
Atmosphere Generators: Hyen generator (shown) for endothermic atmospheres. Generators for all required atmospheres.



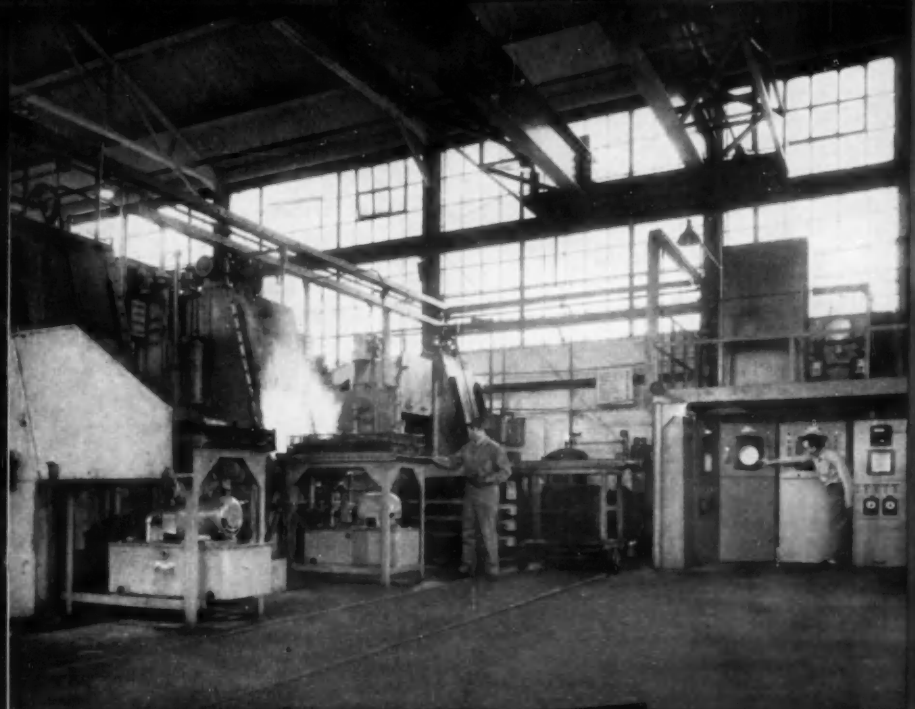
Tempering Furnaces: Box type Cyclone (shown). Temperature range to 1250° F.

Melting and Holding Furnaces: Electric resistance furnace (shown) with capacities of 750 lbs. to 1500 lbs.

Laboratory Equipment: One-unit box furnace (shown), muffle or for non-oxidizing atmosphere with temperature range to 3000° F.

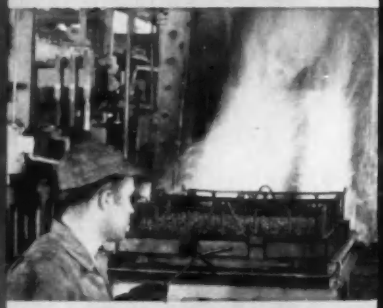


Aluminum Reverberatory Furnaces: Twin-chamber melting and holding furnace (shown) with 45,000 lbs. capacity.



Lindberg-Designed

Charles Hewitt, President of Dayton, says, "The Lindberg installation has kept our production at a consistently high quality level."



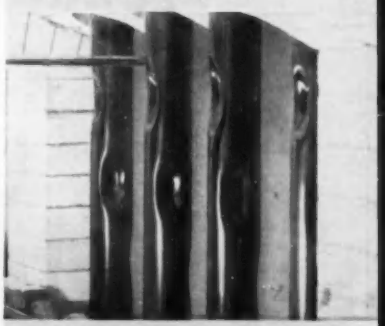
Work loads are positioned manually, but entire furnace operation is fully automatic.

Unique Installation Cuts Heat Treating Costs and Improves Quality at Dayton

Here is a remarkable set-up for general heat treating now in operation at Dayton Forging & Heat Treating Company, Dayton, Ohio. Two integral quench atmosphere furnaces, largest of this type ever built by Lindberg, and one atmosphere tempering furnace in a "three-in-a-row" arrangement that simplifies transfer operation. Combined with Lindberg Carbotrol and Hyen generator, the entire furnace operation is completely automatic, including atmosphere control and recording. Planned by Dayton and Lindberg engineers, the installation runs around the clock, six days a week, reducing costs and producing cleaner end products, brighter job finish, freedom from "decarb" and a consistently higher quality of work.

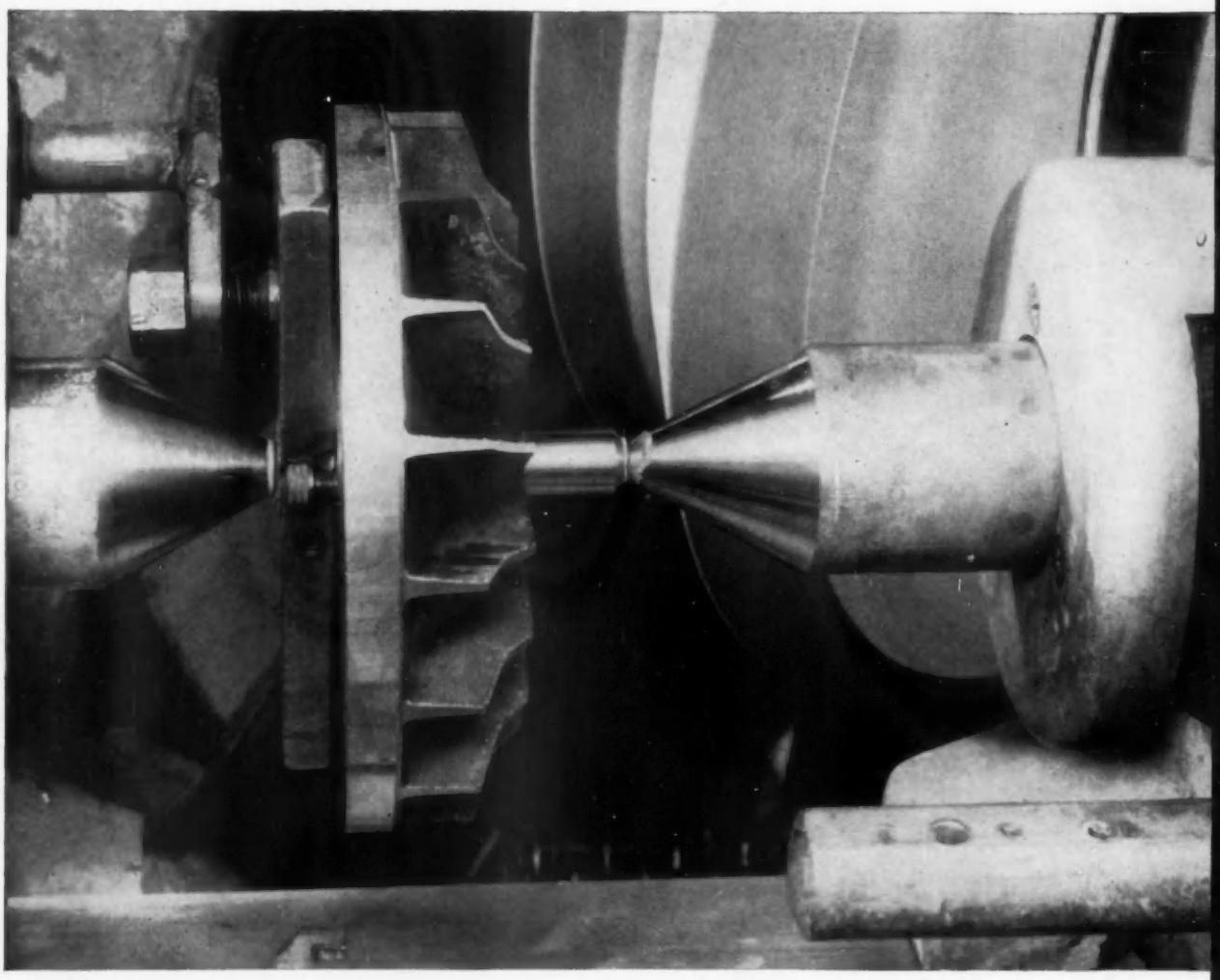
This is another example of how Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, heat treating, melting and holding, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric, whatever is best suited to your production processes. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Avenue, at Downey, California.

Lindberg Carbotrol unit automatically controls and records "dew point" and heating cycles of endothermic atmosphere.



Lindberg's "dimple" vertical radiant tubes give remarkably trouble-free service and function at all times at full efficiency.

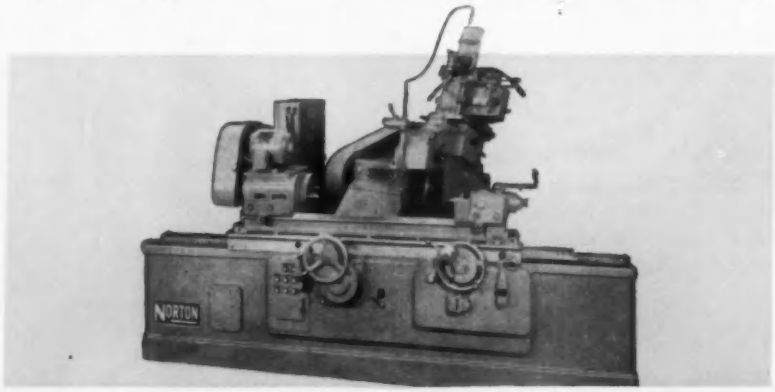
LINDBERG heat for industry



Norton CV-4 Grinder Cuts Production Time in Half

...at large west coast engine component plant

Saves on Grinding Operations



One Operation Does It! A Norton Type CV-4 10" Semiautomatic Angular Wheelslide Grinder was installed by the AiResearch Industrial Division of the Garrett Corporation to precision grind diesel engine turbocharger turbine wheels to increments as fine as .0005". Previous grinders performed 4 separate grinding operations. The Norton CV-4 increased efficiency and reduced grinding to a single operation. As a result, production time dropped from 19½ to 8½ minutes, for each turbocharger . . . a 56% reduction!

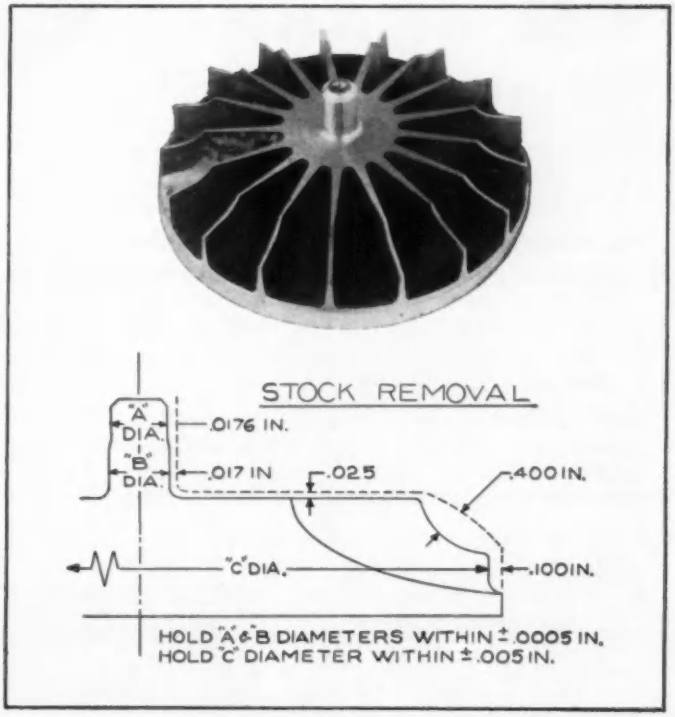
"Norton Type CV-4 Semiautomatic Angular Wheelslide Grinders combine shoulder and diameter grinding to give big operation economy."

Combining several precision grinding jobs and doing them faster and better is routine performance for this cylindrical grinder. For example, it leaves a concentric grain pattern on shoulders, improving the sealing quality and appearance. The CV-4 gives the "Touch of Gold" to your production by reducing effort, time and costs, and increasing your grinding profits.

- Automatic grinding cycle saves operator's time and effort and makes possible his tending more than one machine. Once the cycle starting lever is pulled the machine takes over and automatically grinds to size.
- Automatic wheel head mounted truing device provides pushbutton control of straight, stepped or formed wheel truing—eliminates need of skill and reduces wheel cost per piece ground.
- Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.

Type CV-4's can do the work of two or more ordinary cylindrical grinders in your plant. They are available with hand table or hydraulic power table traverse in 10″ and 14″ sizes, and in work lengths of 18″, 36″, 48″ or 72″. *Improve your competitive position and increase your grinding profits* — replace obsolete grinding equipment with these modern machines. Ask your Norton Representative for Catalog No. 1658-2, or write us direct. Remember, only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.

Set-And-Forget Automatic Operation Saves Labor . . . requires minimum of manual operation . . . loading, locating, starting cycle and unloading. Thus valuable labor is released for other work, yet precision is automatically maintained. For stock removal see diagram below.



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GRINDERS and LAPPERS

Making better products...to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

If it moves...

ROCKWELL-STANDARD BRAKES CAN STOP IT!

the versatile DLM BRAKE offers greater flexibility... dependability!

The revolutionary DLM brake will serve effectively with a variety of equipment. It has already proved its value as a control or parking brake, and is used in various sizes on trucks, busses, machinery, farm equipment, cranes, shovels, hoists, golf buggies, lift trucks.

Highly Efficient! The DLM brake is basically a self-energizing two-shoe brake in which both shoes are more efficiently utilized to produce the same amount of work—give equal forward and reverse torque output, regardless of drum rotation.

Simpler! Only 8 parts, with interchangeable shoes and springs. Lubrication is not required. No internal adjustment necessary. Enclosed design guards against entrance of foreign matter and requires only a minimum of maintenance.

Lighter! More Payload Advantages! Improved design using lightweight fabricated steel shoes and brake supports saves many pounds over heavier, more costly brakes.

©1958, R-S Corp.

Another Product of...

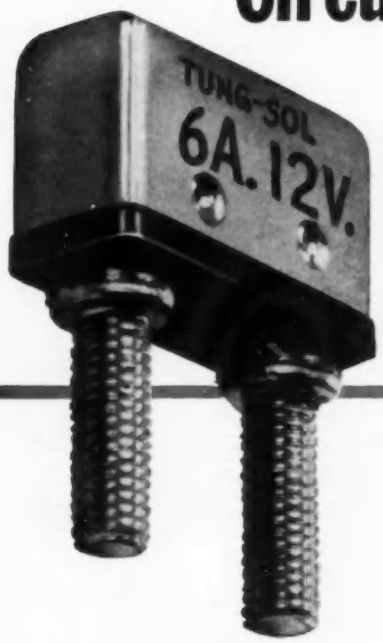
ROCKWELL-STANDARD CORPORATION

BRAKE DIVISION Ashtabula, Ohio

ROCKWELL R STANDARD

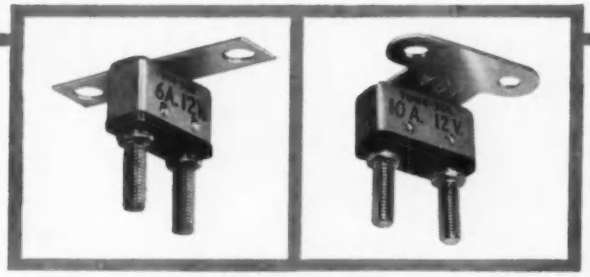
For every industrial, agricultural or automotive application where braking is required!

Tung-Sol 12-Volt Remote-Reset Circuit Breakers



Positive "Lock Open" Action gives complete protection against:

BURNED-OUT ACCESSORY MOTORS AND WIRING
PERMANENT BREAKER DAMAGE
RUN-DOWN BATTERIES



Standard Mounting Brackets

The Tung-Sol remote-reset type circuit breakers *lock open*, instead of continuing to pulsate, when the circuit is overloaded or shorted. When the cause of the overload or short is removed, the breaker is then remotely reset. It reactivates the circuit within 30 seconds.

Available in 6, 10, 15, 20, 30 and 40 amp. ratings, in a choice of two mounting brackets, Tung-Sol Remote-Reset Circuit Breakers are used in a wide variety of automotive applications. For further information write Engineering Department.

METHOD OF OPERATION

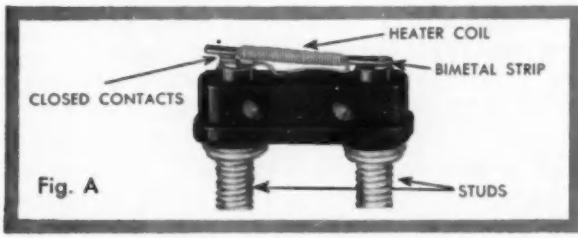


Fig. A

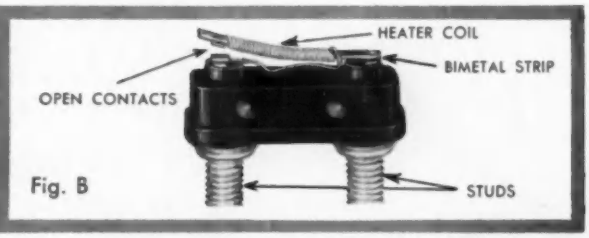


Fig. B

NORMAL CONDITIONS

When circuit conditions are normal, the current flows thru the strip which is attached across breaker studs. When contacts are closed, the heater coil is short circuited and has no heating effect. (Fig. A).

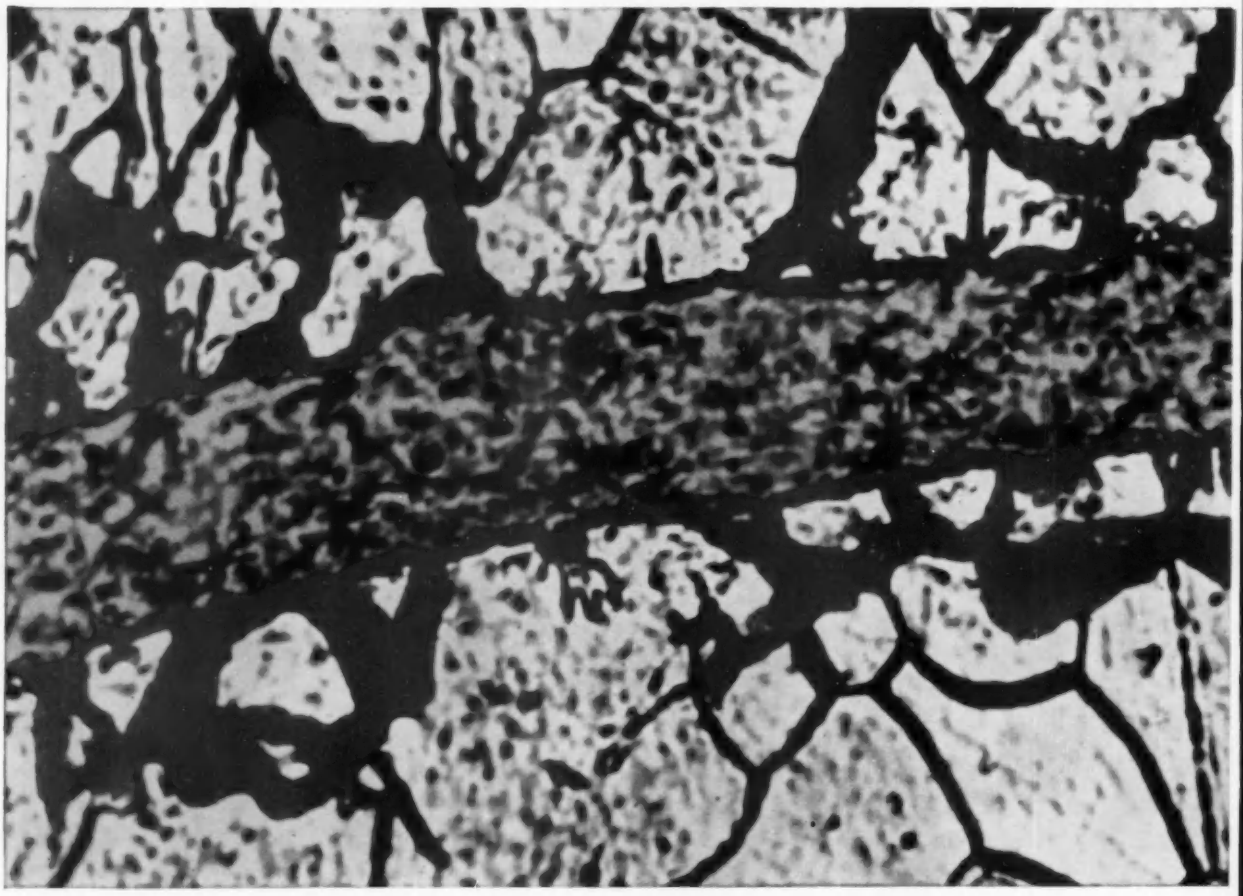
EMERGENCY CONDITIONS

When a short circuit or overload occurs, the increased current causes strip to bend away from contacts. (Fig. B). When the contacts part, the coil is automatically inserted in the circuit.

ELECTROSWITCH DIVISION (ts) TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.

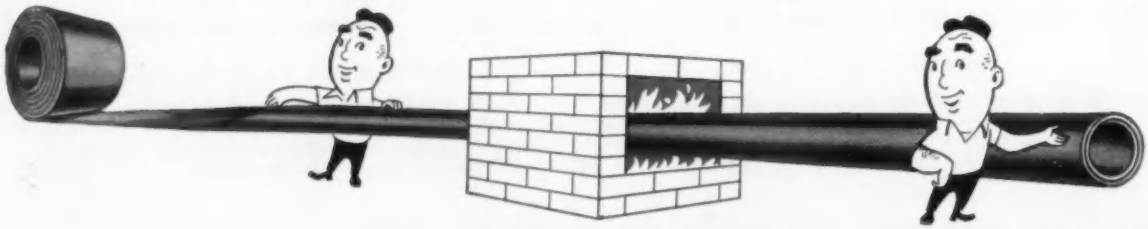
SALES OFFICES: ATLANTA, GA.; COLUMBUS, OHIO; CULVER CITY, CALIF.; DALLAS, TEXAS; DENVER, COLO.; DETROIT, MICH.; IRVINGTON, N. J.; MELROSE PARK, ILL.; NEWARK, N. J.; PHILADELPHIA, PA.; SEATTLE, WASH. CANADA: MONTREAL, P. Q.

WHY BUNDY LEADS IN MASS-FABRICATION:



COPPER BRAZING...Another reason why

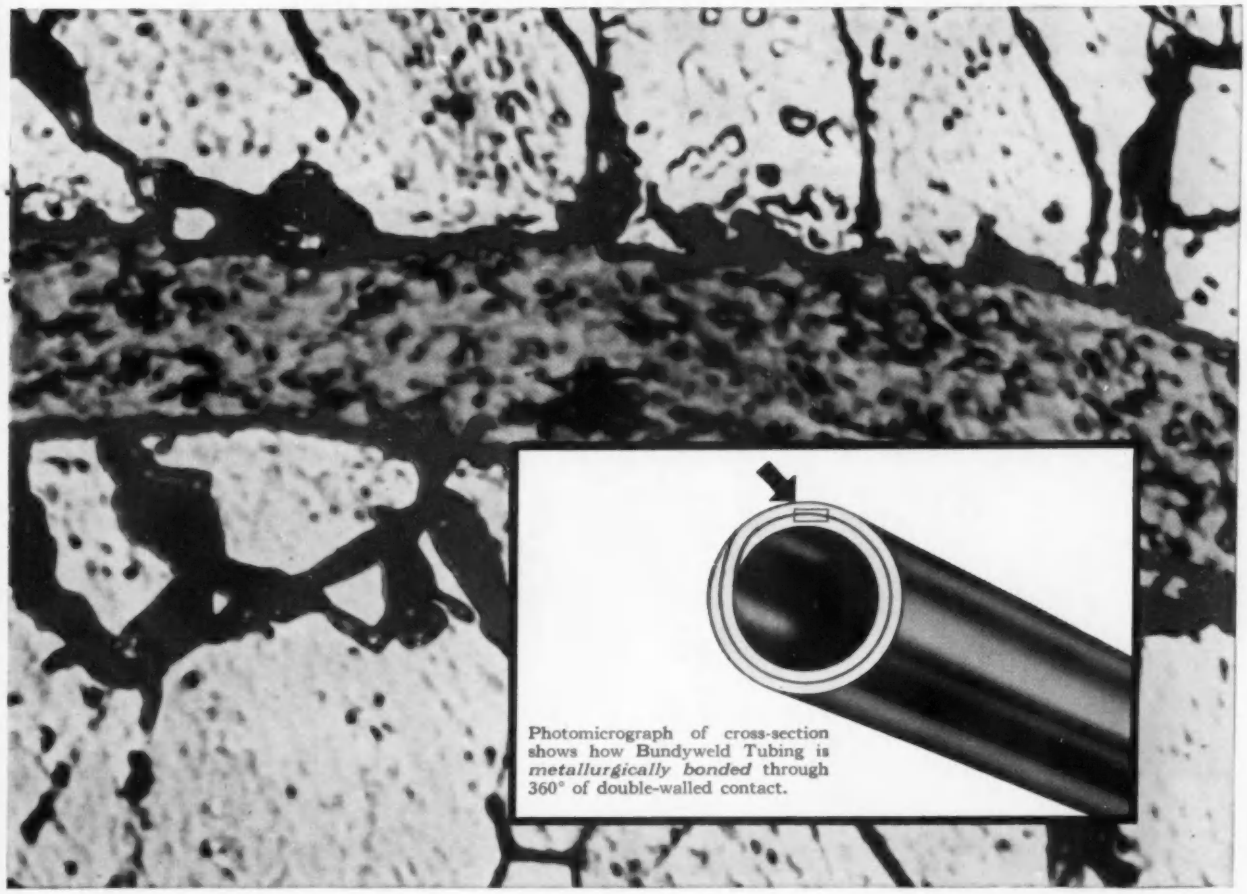
And Bundyweld can be mass-fabricated even in the most complex shapes—at a low unit-cost which results from three Bundy advantages:



Bundyweld starts as a single strip of copper-coated steel. Then it's continuously rolled twice around laterally . . .

into a tube of uniform thickness, and passed through a furnace where copper coating fuses with basic steel.

Result: Bundyweld Tubing—double-walled, beadless, metallurgically bonded through 360° of wall contact.


Photomicrograph of cross-section shows how Bundyweld Tubing is *metallurgically bonded* through 360° of double-walled contact.

Bundyweld prevents hydraulic leakage

This tubing was passed through a furnace where its copper coating *fused* permanently with base steel. It's just one of three reasons why Bundy leads in the modern art of mass-fabrication.

Bundyweld Tubing is copper-brazed to stay *leak-proof by test*. It stands up through brutal shock and punishing vibration . . . still handles high-pressure hydraulics with perfect safety. No wonder Bundyweld is used on 95% of today's cars, in an average of 20 applications each.

Free design service is yours at Bundy. Engineers famous for solving tricky tubing problems will work with you at any stage in the creation of a product; help you get parts at lowest unit cost.

Expert fabrication service is another Bundy specialty. From multiple-bend fuel lines to tiny oiler tubes, skilled technicians will turn out parts to your specifications; deliver them on time, ready to use.

Find out how it pays to check *first* with Bundy on any tubing problem. Call, write or wire us today!

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, GERMANY, AND ITALY

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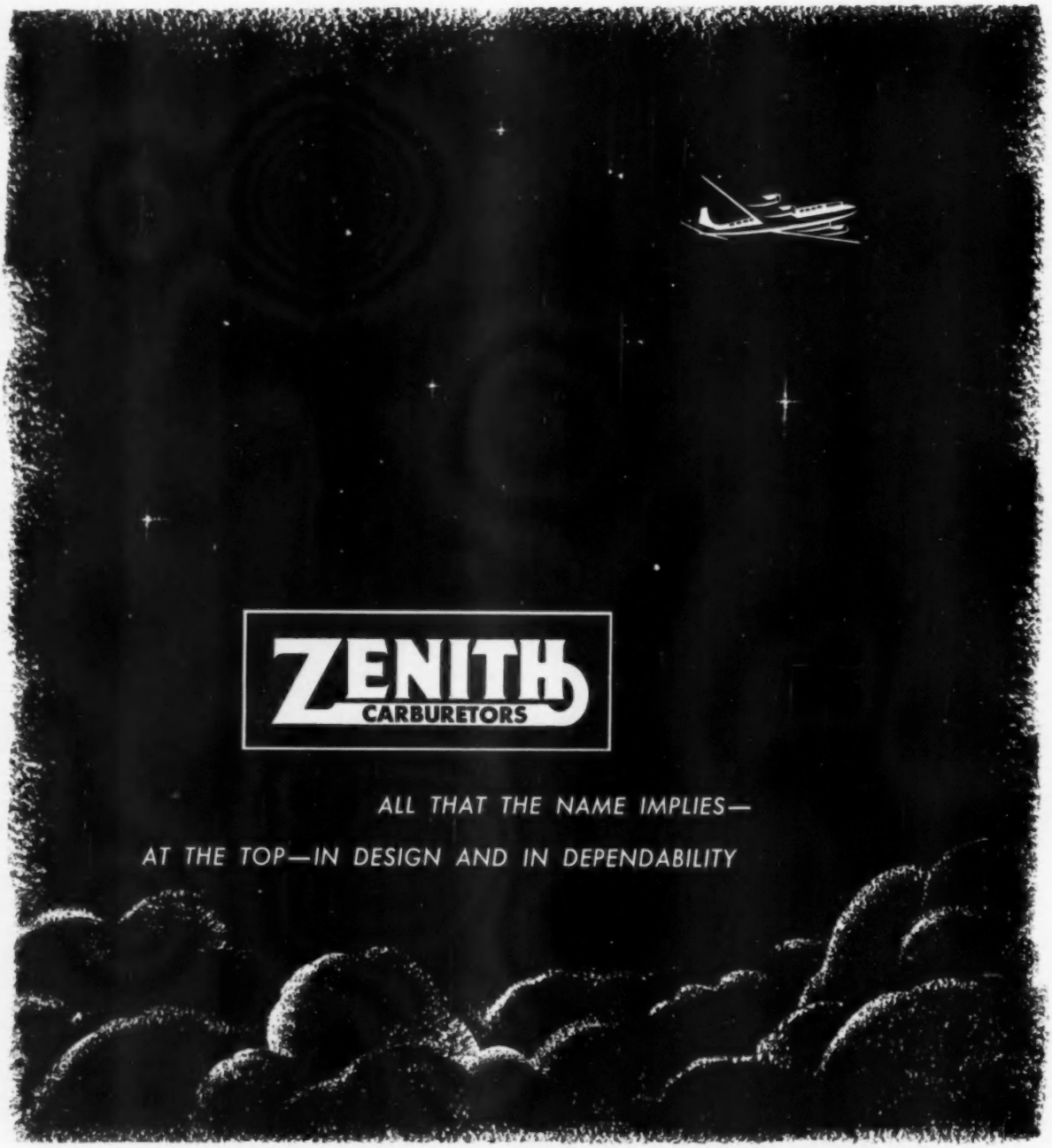
BUNDYWELD® TUBING

Bundyweld and Bundy specialty tubings are sold through distributors in principal cities



For years, Zenith has been favorably known for the manufacture of reliable carburetors—for almost every type of engine. When you have a carburetor problem, we have a unit which probably will meet your special requirements . . . or we have the engineering and production experience to design and build the carburetor you need. Covering a span of about 50 years of engineering and manufacturing progress, **Zenith* actually has more experience in more fields with more engine types than any other manufacturer.** *REG. U.S. PAT. OFF.

Zenith Carburetor Division

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C/R now offers you the advantages of reinforced TFE... designed, compounded and molded by a single source!

If your work involves sealing applications, you are probably familiar with "Teflon", Tetrafluoroethylene Resin. The extreme versatility of its chemical, thermal and mechanical properties are unmatched by any other material on the market.

You may not be, however, fully aware of the degree to which these properties can be distinctly improved by the use of reinforcing inorganic additives. For example, "Teflon" can be blended with inorganics to increase:

- **Resistance to deformation under load — by a factor of 10**
- **Resistance to wear by rotating shafts — by as much as 500 times**
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It is also useful to know that Chicago Rawhide is one of the few fabricators which blends its own "Teflon" compounds, assuring constant quality in batch after batch and permitting compound formulations to be developed rapidly and accurately. Our new laboratory and production facilities are unexcelled – and these facilities are matched by our experience in molding synthetic parts to meet the most critical specifications.

C/R Sirvene welcomes the opportunity to cooperate with you in the design and production of "Teflon" and reinforced "Teflon" packings, bearings, gaskets, rings, or other parts.

If you are interested in "Teflon" write for your free copy of Sirvene Materials Bulletin CT-1.

*"Teflon" is a DuPont registered trademark

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April 24, 1958
Mapes & Sprowl Steel Co.
P. O. Box 425
Burnet Avenue
Union, New Jersey
Attention: Mr. Colen B. Hecox
Reference: Use of Pioneer #921-T Aluminum for Conveyor Wheel in our pencil ferrule striping machines.
Gentlemen:
In order to obtain required accuracy, speed of operation, and reduction in machining cost, we changed from steel to Pioneer #921-T in the construction of the last 10 machines referred above.
The following reasons prompted us to change to Pioneer #921-T:
1. Flatness of material.
2. Lower indexing inertia of arbor wheel due to lighter weight of material.
3. Higher stability under heated operating condition.
4. Substantial savings in machining 144 arbor holes on 23" dia. B.C. which had to be held to .003" T.I.M.
You will find, herewith, a photograph of the referred machine.
This letter is our authorization to use either the picture herewith, our letter or both.
Yours Truly,
AMERICAN MACHINE & MFG. CO.
Paul E. Plante
Paul E. Plante
Partner

Tooling and Production ENGINEERS Agree on 921-T

Paul Plante of American Machine & Mfg. Co. leaves nothing unsaid in stating why Pioneer 921-T Cast Aluminum Tooling Plate was adopted as the ideal material for fast precision machining, with plus advantages of inherent stability and lighter weight than steel. Maybe you have a special production problem that can be solved by Pioneer 921-T. Write for case history bulletin.

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ATLANTA, GA.: Reynolds Aluminum Supply Co.
BOSTON, MASS.: American Steel & Aluminum Corp.
Joseph T. Ryerson & Son, Inc.
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BUFFALO, N.Y.: Joseph T. Ryerson & Son, Inc.
CHICAGO, ILL.: Joseph T. Ryerson & Son, Inc.
Kaole Steel and Aluminum
CLEVELAND, O.: Kaole Steel & Aluminum
DALLAS, TEX.: Vinson Steel & Aluminum Co.
DEARBORN, MICH.: Pioneer Aluminum Inc.
DENVER, COLO.: ABC Metals Corporation
DETROIT, MICH.: Kaole Steel & Aluminum
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FT. LAUDERDALE, FLA.: Caulley Steel and Supply Co.
GRAND RAPIDS, MICH.: Kaole Steel & Aluminum
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RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Selecting the right grade of nuts

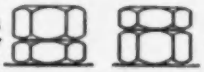
"Workhorse" among nuts is the standard "FINISHED" series. It gives good seating area; sufficient height to sustain high thread tension; enough wall thickness to control elastic nut dilation under load.

"HEAVY" nuts are wider than "Finished" nuts in *all* sizes by only ⅛" across flats. Thus, their value diminishes as size increases. Most effective in ½" to 1½" range, they satisfy applications involving excessive clearance holes, unusual loads, and certain boiler codes.

MATERIALS? The regular carbon nut steel (non heat treated). It makes nuts strong enough to pull bolts beyond yield point, lets threads distribute load to avoid stripping.

NUTS WITH "SPECIAL" FUNCTION

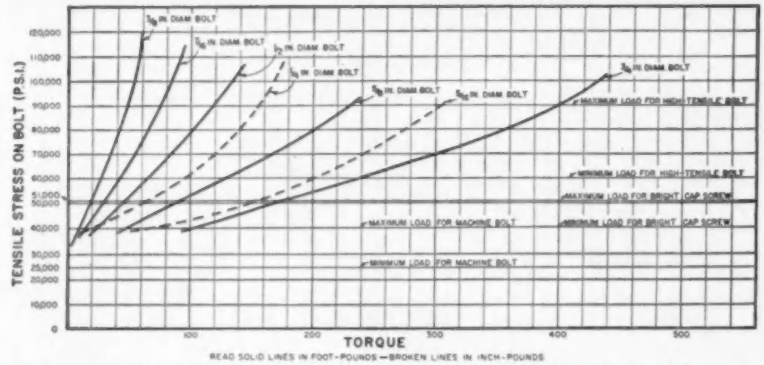
JAM NUTS are made for position locking. Use of two together forms a superior and economical locking device. When used to lock a regular nut, jam nut should be adjacent to work surface. Otherwise, the jam nut takes the load — a job it wasn't designed for.



Use a 2H NUT where high temperatures call for stability.

HIGH NUTS are used for shackle, U and tractor pad bolts. They're furnished only in fine threads, therefore, and hardened. More to be recommended are *coarse thread* finished nuts.

Tightening up fasteners tightens down on costs


TENSILE STRESS ON BOLT (P.S.I.)
TORQUE
READ SOLID LINES IN FOOT-POUNDS—BROKEN LINES IN INCH-POUNDS
MAXIMUM LOAD FOR HIGH-TENSILE BOLT
MINIMUM LOAD FOR HIGH-TENSILE BOLT
MAXIMUM LOAD FOR BRIGHT CAP SCREW
MINIMUM LOAD FOR BRIGHT CAP SCREW
MAXIMUM LOAD FOR MACHINE BOLT
MINIMUM LOAD FOR MACHINE BOLT

These curves suggest torques for proper tightening of three grades of standard fasteners. Tightening to the upper limits delivers more of the holding power paid for, and assures stronger joints. Dropping below minimum values wastes fastener strength, invites loosening and failures. These curves are reproduced in RB&W Booklet DC-1.

It pays to go the limit in tightening bolts. Not only is it more economical, but safer too. For strength of a rigid connection depends on *residual tension* rather than on how strong the bolts are. Applying this fact can help avoid cost penalty.

EXAMPLE:

Blueprint specifies alloy bolts with strength of 145,000 psi. But assembly specification calls for tightening to what has been found an adequate pre-loading . . . only 30,000 psi. This wastes the fastener's capacity. It provides no more joint-strength than supplied by a *far more economical* RB&W bright cap screw tightened to same pre-load. It would be better to switch to the lower grade, or reduce size of the premium grade fastener.

REDUCING SIZE ALSO SAVES

A fastener's holding power is the same as its pre-load, or residual tension. So long as it permits tightening to the required pre-loading, the bolt can be small as possible.

EXAMPLE:

Design requires fasteners with safe load capacity of 20,000 lbs. Bright cap screws of ¾" size will do it; but so will ⅝" RB&W High Strength Bolts — *at less cost*. Actually, for the same holding power as in $1.00 worth of high tensile fasteners, $1.50 worth of bright cap screws are required.

PRODUCTION BENEFITS

Along with direct savings, smaller bolts mean smaller holes to drill or tap. Smaller holes often allow reduction in size of fastened members.

Talk to an RB&W fastener expert at the design stage of your product. He can help you cut costs without cutting joint strength.

Meanwhile, send for helpful booklet DC-1. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

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8548

CALENDAR

OF COMING SHOWS AND MEETINGS

Process Industries Conference sponsored by ASME, Hotel Statler, Buffalo, N. Y. ....Sept. 15-17

Instrument-Automation Conference, 13th annual meeting, sponsored by Instrument Society of America, Convention Hall, Philadelphia, Pa. .....Sept. 15-19

National Industrial Conference Board, annual marketing conference, Waldorf-Astoria Hotel, New York, N. Y. .....Sept. 17-19

ASME Petroleum Division Conference, Hotel Cosmopolitan, Denver, Col. .....Sept. 21-24

Steel Founders' Society of America, fall meeting, The Homestead, Hot Springs, Va....Sept. 22-23

Material Handling Institute, Inc., fall meeting, The Greenbrier, White Sulphur Springs, W. Va. Sept. 22-24

Standards Engineers Society, 7th annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa. .....Sept. 22-24

Seventh Annual Conference on Industrial Electronics, Rackham Memorial Building, Detroit, Mich. .....Sept. 24-25

International Commercial Motor Transport Exhibition, Earls Court, London .....Sept. 26-Oct. 4

ASME Power Division Conference, Statler Hotel, Boston, Mass. Sept. 28-Oct. 1

Pressed Metal Institute, annual meeting, The Cloisters, Sea Island, Ga. .....Sept. 28-Oct. 2

SAE National Aeronautic Meeting, Production Forum, and Aircraft Engineering Display, Ambassador Hotel, Los Angeles, Calif. .....Sept. 29-Oct. 3

ASTE Semi-Annual Meeting and Western Tool Show, Shrine Exposition Hall, Los Angeles, Calif. .....Sept. 29-Oct. 3

Fourth Joint Military-Industrial Packaging and Materials Handling Symposium, sponsored by Dept. of Navy, Washington, D. C. .....Sept. 29-Oct. 5

National Screw Machine Products Association, executive seminar, Brock-Sheraton Hotel, Niagara Falls, Canada .....Sept. 30-Oct. 1

Paris Automobile Show.....Oct. 2-12

National Rubber & Plastics Instrumentation Symposium, sponsored by Instrument Society of America, Akron, O. .....Oct. 20-21

SAE National Transportation Meeting, Lord Baltimore Hotel, Baltimore, Md. .....Oct. 20-22

SAE National Diesel Engine Meeting, Lord Baltimore Hotel, Baltimore, Md. .....Oct. 22-24

MEMO
Tom: You ask why SPIROLOX Retaining Rings? well— Here are just a few reasons
This ring eliminated failures, solved our service problems, and saved us assembly time!
Tom note: Full circle (360°) retaining surface!
PISTON PIN RETAINER (Internal use example)
No groove "pop-out" problems here, Tom. That SPIROLOX is in there to stay!
"ROLL-LOCK" CHUCKING TOOL (External use example)
Reusable, too! No loss of circularity or holding power. Think of the savings!
Know how I put that ring in? With a screwdriver! Know how I can get it out? With a screwdriver! No special Tools with SPIROLOX, Tom— easy in, easy out!
See? Automatically locks itself in the groove under thrust. Can't wind or unwind!
Here's a retaining job for you! Resists thrust up to its own shear strength!
—And how's THIS for a uniform shoulder? Uniform ring height, too!

FREE SAMPLES FOR ENGINEERING TEST

Spirolox has proven the solution for hundreds of manufacturers. *Test samples* may give you the answer to your problems — or demonstrate there is a better way. Test samples of Circolox, Ramco's newest development in retaining rings are also available. Send us blueprints or sizes needed for tests — and we'll gladly send samples of both types, plus Data Bulletins. Write Ramsey Corporation, Sub. of Thompson Products, Inc., Dept. H, St. Louis 8, Missouri.

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STANLEY APPLEBY—*Comptroller*

High Spots of This Issue

▼ Chrysler Corporation's 1959 Line

This article highlights the mechanical features common to the Chrysler Corp. 1959 car line. Among the items covered are two new power plants, rear wheel suspension, swivel seats, and two new safety electronic accessories. Page 48.

▼ Heat Treating Steering Gear Parts

Ross Gear and Tool Co. engineers solved the problem of heat treating large numbers of steering assembly parts in a single cycle by using a high-alloy cast fixture of articulated design. The heat treating cycle is described here. Page 51.

▼ 1959 Buick

Buick boasts an entirely new line for 1959, consisting of four series, each with a new designation. Among the important changes: a 401-cu in. engine for the top three models, an improved aluminum brake drum, and a new suspension system. Page 52.

▼ Testing Air Suspension System Components

To test automatically the multiple-chamber air-oil separator of the closed-type air suspension system built by AC Spark Plug, engineers at Jered Industries designed a dual compressor pneumatic unit that tests the system under simulated road conditions. Page 55.

▼ Die Casting Cylinder Blocks and Heads

Outboard Marine Corp. holds down the weight of its four-cylinder, V-type, 50-hp engines by die casting the entire cylinder block in aluminum alloy. A description of the entire process, starting with the production of the aluminum alloy, is given here. Page 56.

▼ 35 New Product Items And Other High Spots, Such As:

Making transmission parts; Mercury's Rivera plant; twin overhead MGA; extruded steel bars; latest Albion trucks; airbriefs; news of machinery industries; and industry statistics.

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AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 119, No. 6 **September 15, 1958**

Chrysler Spent $150 Million To Bring Out Its 1959 Line

The 1959 line of Chrysler Corp. cars cost $150 million to develop and tool, company president L. L. Colbert revealed at the recent Miami Beach press showing of the new models.

Colbert said his company invested in its 1959 line with full confidence that the nation is on its way out of the recession and that automobile sales for the coming year will increase by nearly 30 per cent over '58 sales. He based this prediction on estimated sales of 5.5 to 6 million units next year compared to 4.6 million sales during 1958.

The entire Chrysler Corp. line—Imperial, Chrysler, De Soto, Dodge, and Plymouth—was shown to some 350 of the nation's automotive press at a three-day meeting in Florida. The company also displayed the Simca line, which Chrysler now distributes in this country.

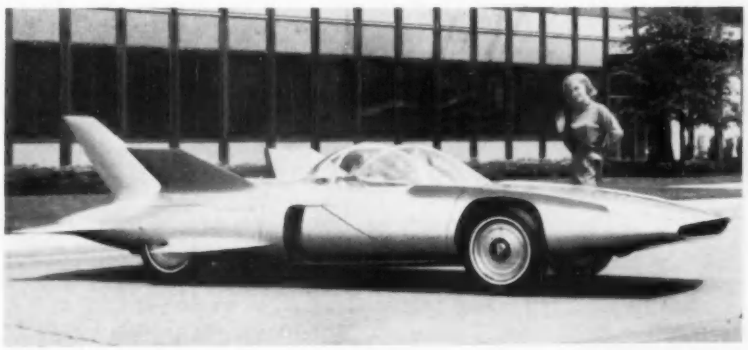
Speaking of Simca and small cars in general, Colbert told the press that a staff of hundreds of people are at work styling and developing a small car "of the type we believe would meet the needs and desires of American motorists."

He admitted that some basic decisions have been made, and he revealed that Chrysler has settled on a car big enough for five persons and their luggage, and that the car will be a front engine vehicle.

Colbert repeated his earlier explanation of the importance of the Simca pact, pointing out that the world market for a car the size and style of the Simca is still growing. By 1965, he said, between 6 and 7 million passenger cars, most of them small, will be sold annually in countries outside the U. S. and Canada.

To back up his confidence in the pickup in automobile sales during the coming year, Colbert drew several parallels between 1958 and 1954, the year that preceded the industry's record year of 7.2 million sales.

Most of the durable goods industries had been operating at levels below the previous year in both of his comparison periods. Employment had been down sharply in some industries, he said, car purchasing had been postponed, and income and savings were at very high levels.



Shown here is GM's latest experimental gas turbine car, Firebird III.

GM's New Firebird Dream Car Called 'Experiment in Control'

General Motors is ready to unveil another experimental Firebird dream car, this one designed and built around a single stick control system.

The Firebird III, in fact, has been called an "experiment in control," because it emphasizes electronic guidance and the single stick system which eliminates conventional steering wheel, brake pedal and accelerator.

The new, gas turbine-powered test vehicle will be given its first public display at GM's Motorama next month in New York City. The car recently underwent tests at GM's Desert Proving Ground in Arizona.

GM president John F. Gordon said the Firebird III has "more new design and engineering ideas than either of its predecessors."

The first Firebird emphasized power. It was the first gas turbine passenger car built and tested in this country. Firebird II, while featuring an improved gas turbine, stressed chassis and suspension, plus passenger comfort and convenience.

But missile-shaped Firebird III features a combination of improved versions of automatic steering and speed control, plus single stick control for all driving and parking functions.

The gas turbine is lighter, more compact, and 10 per cent more powerful than the previous Firebird turbine, and it consumes 25 per cent less fuel. The engine, the Whirlfire GT-305 regenerative gas turbine, is rated at 225 hp at 33,000 rpm gasifier speed.

The engine, transmission (modified Hydra-Matic) and differential are designed as a single rear-end unit. The transmission is mounted directly between the differential case and the engine.

NEWS AUTOMOTIVE AND AVIATION

THREE-WHEEL VAN

Latest version of Reliant 3-wheel, quarter-ton delivery van has larger body and extended wheelbase for greater payload, while using fiberglass panels and light alloy components to keep unladen weight down to 890 lb. The four-cylinder 45 cu in. engine develops 17.5 hp at 4000 rpm, driving through a 4-speed synchromesh gearbox. Front suspension comprises a single rubber-bushed arm carrying the stub axle. Sedan and coupe models are also available.

Firebird III has a 10 hp, 2-cylinder aluminum accessory engine mounted in the front of the vehicle.

Suspension is an interconnected air-oil system with a 3000 psi hydraulic system and solid axles suspended from four pivotally mounted control arms. Rear suspension is De Dion.

The car measures 44.8 in. to the top of the passenger compartment bubbles, and 53.7 in. to the top of the dorsal fin. Wheelbase is 119 in. and overall length is 248.4 in. Front and rear treads are 57 in.

Pontiac Aims for Fifth Place And 7 Per Cent of the Market

Pontiac Motor Div., with a new line of bigger and more powerful automobiles, is aiming for fifth place and 7 per cent of the total industry market during 1959.

But Pontiac is making a simultaneous bid for a portion of the so-called economy market with an optional gas-saving engine.

The new model is longer, wider and lower. Length has been increased from 3.5 to 6 in. Tread has been widened by 5 in. The roofline has been lowered as much as 3 in. emphasizing the lengthy appearance. And horsepower in the standard engine has been increased from 280 to 300.

The optional engine, which is offered at no extra cost, will deliver up to 10 per cent greater mileage on regular gasoline, according to division general manager Semon Knudsen. The economy engine, rated at 225 hp, has a compression ratio of 8.6 to 1. Use of regular fuel, Knudsen said, should mean in-pocket savings of 20 per cent to the customer.

The standard 300 hp V-8 has a compression ratio of 10 to 1.

The new Pontiac will be introduced to the public Oct. 9. The line will consist of 14 body styles in three series—Catalina, Star Chief and Bonneville. Air suspension is being continued as an option, but fuel injection, too costly, is being dropped.

Speaking of the economy engine, Knudsen said that "we know the public is interested in economy," and Pontiac intends to find out how much. The optional V-8 engine is the same basic unit as the standard powerplant, but with an economy carburetor, improved manifold, new cam, and a special differential.

Knudsen said original estimates of economy engine sales are 9 or 10 per cent, although it was pointed out that the division is prepared to go as high as 40 or 50 per cent, if sales demand.

The bulk of Pontiac's sales still are made to the one-car family, Knudsen said, indicating that Pontiac must "be a multi-purpose automobile."

Stylewise, the '59 Pontiac emphasizes sheet metal sculpturing rather than chrome and brightwork, Knudsen added, although the latter have not been eliminated entirely.

Goodyear, US Rubber Announce New Tires for Passenger Cars

Goodyear Tire & Rubber Co. and United States Rubber Co. have announced new lines of tires for passenger cars.

Goodyear is marketing a full line of racing tires for stock car use on high speed asphalt and hard surface tracks, dirt tracks, and dirt and loose surface tracks. The 3-T nylon cord tires have a tapered shoulder and wider outer rib instead of the conventional square shoulder so that cornering pressures are spread over a wider tread area.

The US Rubber tire is a nylon cord tire with a low profile—wider in cross-section than it is high. Called the Low Profile U. S. Royal Master, the new tire gives 60 per cent more mileage than the average original equipment tire and 40 per cent more mileage than any competing premium tire, according to tire division general manager C. R. Cuthbertson.

Hercules Motors to Market Ilo Line of Engines in U.S.

Hercules Motors Corp. has acquired sole American rights to the German-built "Ilo" line of air-cooled Diesel and gasoline industrial engines and will market them in the U. S. under the "Ilo" name.

William L. Pringle, president of Hercules, said the engines have a broad application as a power source in fields such as industrial, agricultural, and construction equipment.

Complete service and parts for the engines will be maintained through Hercules' network of 76 U. S. distributors, the announcement said. In addition, the company will make its engineering facilities available to those interested in new applications of this type of power to various equipment.

The Ilo Diesel line consists of two basic one-cylinder models— a 7.2 hp high-speed (2800 rpm) unit and a 12 hp, 2000 rpm model, featuring cast aluminum cylinder block, crankcase, and piston.

All GM Cars in '59 to Have Acrylic Lacquer Finishes

All five General Motors passenger car divisions will offer acrylic lacquer as standard finish on all models during the 1959 year, Fisher Body Div. announced recently.

The acrylics are said to have three

times the life and 22 times the colorfastness of the conventional lacquers used in the past. GM has used acrylics to a limited extent since 1956, when some Oldsmobiles, Chevrolets and Pontiacs received the finish on a test basis.

In 1957, 25 per cent of the GM cars had the Magic Mirror finish, as it is called, and during the 58 model year nearly one million cars were painted with acrylic lacquer. The paint was 10 years in development.

Fisher Body general manager E. C. Klotzburger said the acrylic retains up to 75 per cent of its original luster without polishing after one year's exposure to weather. The finish is highly resistant to common stains from oils, grease, road tars and leaves, he added.

Fisher Body requires four and one-half hours to apply a Magic Mirror finish to a car, from a six-stage rustproofing process to the final four-coat acrylic lacquer application. The division invested more than $1 million in new application equipment to prepare for the '59 model run.

S-P Forms Sales Subsidiary For Mercedes-Benz Car Line

One of the first steps in Studebaker-Packard's retrenchment program was taken recently when the corporation formed a wholly-owned subsidiary, Mercedes-Benz Sales, Inc., to handle the German passenger car line in this country.

Harold E. Churchill, president of S-P, is chairman of the board of the new firm, and L. A. Fleener is president. The subsidiary will have its headquarters in S-P's central office in South Bend.

Churchill, in announcing the move at the end of August, said "the new subsidiary is a logical outgrowth of the expanding Mercedes-Benz market in the U. S. The subsidiary will devote all its time and effort to further exploit and expand the sales of Mercedes-Benz motor cars."

But some observers believe that there are more practical reasons such as a yearly economy of $1 million to S-P in license fees it is now paying.

A subsidiary of Daimler-Benz of Germany will make available to the new S-P subsidiary, on a deferred payment basis, a "substantial inventory" of Mercedes-Benz vehicles, spare parts and accessories.

Fleener has been general manager of M-B operations since April, 1957, when the South Bend firm acquired distribution and manufacturing rights to the German automobile. Before that he spent 15 years with White Motor Co. and 14 years with General Motors.

Oldsmobile Plans To Hang Onto Fourth Place with 1959 Models

Oldsmobile Div. plans to hold fourth place in passenger car sales with a finless car that will introduce two new body styles in all three series (Dynamic 88, Super 88 and 98).

The two new body styles are the Holiday SportSedan and the two-door Holiday SemiCoupe.

Jack F. Wolfram, Oldsmobile general manager and a GM vice-president, said there were signs of 1959 being a good year, "provided we are not hampered by unnecessary strikes" and union-instigated work stoppages. He made this statement shortly after learning of new walkouts at GM plants in Grand Rapids and Flint, Mich., and Elyria, O.

Oldsmobile's current fourth place sales position was achieved, Wolfram said, because of the division's styling, engineering and high reputation for quality, together with excellent dealer cooperation.

Production was scheduled to begin Sept. 2 at Lansing, with a schedule calling for 25 per cent higher production than during the latter months of the '58 model run. He said the division will add approximately 1500 persons within a few weeks of start-up "unless production plans are interrupted by uncalled-for" stoppages.

American Motors Corp. Plans 2-Door Rambler Station Wagon

American Motors Corp. announced it is going to add a two-door Rambler station wagon to its 1959 line.

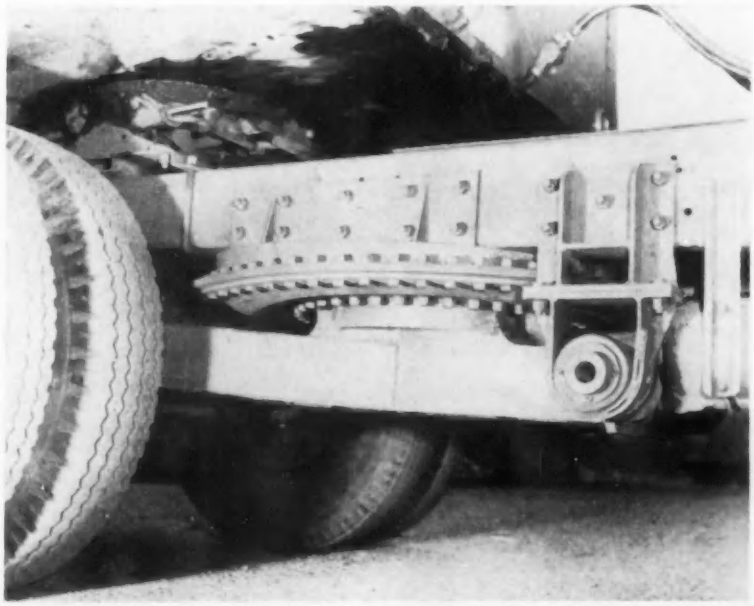
Roy D. Chapin, automotive executive vice-president, said the decision came as a result of the success of the Rambler sedan. The station wagon will be built on a 100-in. wheelbase and is scheduled for introduction in October.

Ford Will Add 11,000 Employees By December for 1959 Output

Ford Motor Co. has started calling back employes for 1959 model production, and by the end of November the company expects payrolls to top 106,000 hourly workers.

This is 11,000 higher than the summer average prior to model changeover layoffs, according to John S. Bugas, vice president-personnel.

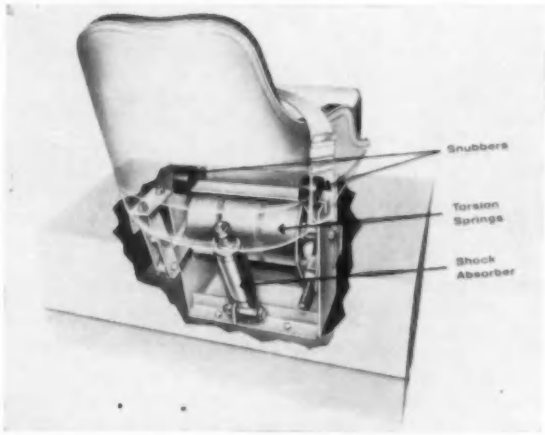
Bugas said the company's manufacturing and product divisions have increased their hourly manpower requirements by 3500 in the past several weeks.



NEW AIR SUSPENSION PUTS LOAD ON SINGLE DIAPHRAGM

New air suspension system shown here features a single centrally located diaphragm of multi-ply construction on which the load is "sprung." In a typical installation, a 42-in. diameter diaphragm will support a load of over 48,000 lb at 35 psi. Without load, 5 to 7 psi is sufficient. Should air be lost for any reason, the frame will come down gently and evenly on the snubbers and the vehicle can be driven that way. The system, designed by Air Springs, Inc. for all types of vehicles will be manufactured under license by Reynolds Mfg. Co., Springfield, Mo.

NEWS AUTOMOTIVE AND AVIATION



TORSIONFLEX SEAT

A new system of seat suspension for greater operation comfort is now available in Caterpillar wheel tractor-scraper units. The new Torsionflex seat consists of three rubber torsion springs rigidly fixed on one end and free to flex on the other. A double-acting shock absorber eliminates objectionable oscillation and rubber snubbers prevent the seat from "bottoming" when a severe bump is encountered.

Detroit Engineer Recommends Six Changes in Truck Design

The truck driver gets his most uncomfortable ride in a tractor-semitrailer combination, with cab-over-engine tractor and foam rubber seats.

This is one of the findings of a recently published SAE permanent special report by Robert N. Janeway, Detroit consulting engineer who specializes in vehicle suspensions.

Janeway, former assistant director of Chrysler engineering research, listed six factors of truck design which could be changed to improve riding qualities for the truck driver and cargo.

Vertical bounce, the article reports, is more tolerable for driver comfort than fore-and-aft shake. Quoted data shows that human subjects can tolerate three to five times as much vibration vertically as fore-and-aft.

Among major changes recommended by Janeway to bring trucks and tractors closer to passenger cars in driving comfort are:

- Redesign tractor fifth wheel to elevate the pivot axis—the point from which shakes in the driver's cab begin.
- Replace present stiff springs at both ends of truck or tractor with softer springs having a higher total deflection.
- Reduce friction of present leaf springs by providing proper lubrication and suitable protective spring covers.
- Damp the seat cushions.
- Match front and rear static spring deflections to get the kind of ride sought.
- Increase the dynamic index of the vehicle by shortening the wheel base or by raising the pitch axis of fifth wheel closer to the trailer center of gravity.

Buick Makes Major Installations In Three Departments for 1959

Buick Motor Div. has made major plant installations in three key departments as part of the multi-million dollar changeover to 1959 production.

To give an idea of how extensive (and costly) Buick's conversion was, here is a partial outline of some of the major changes that were required.

In sheet metal, three giant new presses were installed for stamping the hood and front fenders. Each press is 46 ft. high, weighs 700,000 lb, and exerts 800 tons of pressure.

The foundry has been equipped with a new Taccone automatic line for direct sand casting of the aluminum rear brake drums. This new installation represents a new technique for Buick, going into its second year with aluminum brakes.

In the engine plant, a 100-ft section has been replaced in the transfer line for machining the new 401 engine case. Other alterations of a lesser degree were made to accommodate changes in rods, cylinders, and intake manifold.

Buick also is initiating a hot stand test for balancing the new 401 engine.

New welding equipment and machinery rebuilding, along with new dies and heads, formed the major part of the plant changeover in manufacture of rear axle and track bar, exhaust system, transmission and other parts.

Buick emphasized rebuilding of existing machinery this year wherever possible, with the result that the cost of conversion never would show up in just new dies and equipment alone.

Delco-Remy Div. Mechanizes Battery Assembly Operations

Delco-Remy Div. of General Motors announced it has completely mechanized assembly operations at its Delco battery plant in Anaheim, Calif.

J. H. Bolles, Delco-Remy director of engineering and sales, said the new facilities answer "a long felt

LeTOURNEAU TO INTRODUCE 70-TON EARTHMOVER

World's largest earth mover, depicted in this engineered sketch, is scheduled for introduction at the American Mining Congress in San Francisco this month. First units of the new line, built by LeTourneau, Inc. will be in the 70 and 125-ton class—roughly equivalent to 50 and 100 cu yd capacity. Big 600-hp Diesel-electric dynamo will furnish power to high-torque electric motors geared directly to the inner rim at each wheel.

need for a fast, automatically controlled, completely dependable battery assembly process."

The new assembly facility operates on the indexing principle, he pointed out. Basically, it consists of a waist-high conveyor line, with work stations mounted above it. Battery cases are indexed along the line, stopping for the right amount of time beneath each station. All work stations and inspection stations are electrically interlocked by a maze of memory circuits which mastermind the entire assembly process.

Automatic inspection units, strategically located along the line, check for electrical resistance, seek out short circuits and acid leaks, and probe for other defects. If a defect is found information is instantly relayed to the memory circuit drum and the battery is locked out from subsequent operations.

Chrysler Uses Radio System To Dispatch Detroit Fleet

Chrysler Corp. has installed an ultra-high frequency radio system in 85 company trucks and cars in the Detroit area for coordinating fleet operations. The 460-470 megacycle radio system covers an area nearly 100 miles wide and includes 40 Chrysler plants and office buildings and nearly 3500 suppliers. The main transmitter is located atop a downtown Detroit skyscraper.

Chrysler has smaller two-way radio systems in operation at individual corporation plants in Michigan, Ohio and Indiana and at the Engineering Div. proving grounds at Chelsea, Mich.

Nance Resigns as M-E-L Head, Mills Named to Succeed Him

James J. Nance resigned as vice-president and general manager of the M-E-L Div. of Ford Motor Co. He was succeeded by Ben D. Mills, another Ford vice-president, who had been assistant general manager under Nance.

Company president Henry Ford 2d also announced the appointment of Walker A. Williams as vice-president and assistant general manager of the M-E-L Div.

Nance, whose resignation came as a surprise to many of his associates, joined Ford in November 1956. Previously he had served as president and general manager of Packard Motor Co., and head of the merged Studebaker-Packard Co.

AI TABLOID

C. M. Hall Lamp Co. of Detroit purchased manufacturing assets of Knight-Morley Corp. and will operate the firm's plant under lease. Knight-Morley makes automobile mirrors and other accessories in a 35,000 sq ft facility at Richmond, Mich.

* * *

A newly formed Electronics-Instrumentation Dept. at the General Motors Technical Center in Warren, Mich., will service more than 15,000 instruments used at the Research Laboratories and will assist in gathering data and develop advanced instrumentation.

* * *

Budd Co. announced development of a new trailer brake drum which features a flared rib or bell-like extension at the open end of the drum that extends beyond the wheel and dust shield into the air stream passing beneath the truck. As a result, the flared drum is slower to heat up, cools off faster and shows far less deflection than other drums with which it was compared, the company reports.

* * *

A. F. Holden Co., Detroit, Mich., reports it has found an answer to the problem of instant heat transfer with its new luminous wall firing or "instantaneous heat" system. During a recent test, the company says, a solid 2-in. iron cylinder, 6 in. long, was heated from 80 F to 2000 F in less than 20 minutes and was cooled back down to 1000 F in 16 minutes while still in the furnace by means of controlled, continuous air flow through the porous refractory lining.

* * *

The Army has organized a central office of research to manage its rapidly growing research program. Besides supervising and coordinating all Army research activities, the new organization, known as the Army Research Office, will seek close cooperation with American scientists and technicians.

* * *

Detroit Harvester Co. opened a 32,000 sq ft engineering research center near Detroit for design and prototype work for all seven of the company's divisions.

Reaction Motors Div. of Thiokol Chemical Corp. will establish facilities at Bristol, Pa., for production of the new packaged liquid engine power plant known as the Guardian. Thiokol recently received a Navy production contract for the Guardian with deliveries scheduled for next spring.

* * *

U. S. Steel Corp. developed an ultra-high-strength alloy sheet steel called Airsteel I-200 designed for missile applications. The new steel is said to attain its high-strength characteristics as a result of a careful balancing of alloying elements which are suitable for making steel "air hardenable."

* * *

Tapco Group, Thompson Products, Inc., announced two new process techniques which can be used separately or together to produce tubular parts and components as one integral piece of metal from end to end, thus eliminating end fittings, welding, and brazing. Known as "metal gathering" and "flotrusion" both methods are suitable for application with a wide range of materials including alloy steels, aluminum, titanium, and zirconium.

* * *

The Defense Department established a Defense Metals Information Center at Battelle Memorial Institute to collect and disseminate the latest technical information on titanium, beryllium, refractory metals, high strength alloys for high temperature service, corrosion and oxidation resistant coatings, and thermal protection systems. The new center will serve defense contractors, subcontractors, and other suppliers as well as Government agencies.

* * *

Aeronutronic Systems, Inc., is constructing a 125,000 sq ft computer development building at Newport Beach, Calif., to house research, development, and manufacturing of special purpose computers for military and commercial use.

* * *

Sylvania Electric Products, Inc., has announced plans for construction of 70,000 sq ft electronic systems plant near Williamsport, Pa.

NEWS AUTOMOTIVE AND AVIATION

Frederick G. Donner (left), chief executive officer, and John F. Gordon, chief operations officer

Donner-Gordon Team Head GM Under New Management Plan

Policies and programs of General Motors will be guided in the future by the new management team of Frederic G. Donner and John F. Gordon, named last month to succeed Harlow H. Curtice as head of the world's largest corporation.

Donner, formerly executive vice-president and chairman of the Financial Policy Committee, is the new fulltime board chairman and chief executive officer. As such, he is top man in the new organizational chart.

Gordon, formerly vice president and group executive in charge of the body and assembly division, becomes president and chief operations officer. He is No. 2 man in the corporation.

Curtice retired Sept. 1 as president, chief executive officer and chairman of the Operations Policy Committee. Functioning in these three capacities, he was top man. Retiring with Curtice was Albert E. Bradley, board chairman and 39-year veteran with GM.

Both Donner and Gordon will have distinct responsibilities in separate fields. The key to their distinction lies not in their primary titles of board chairman and president, but rather in their secondary roles—Donner as chief *executive* officer and Gordon as chief *operations* officer.

Donner is essentially a financial man, while Gordon is an engineer with vast experience in manufacturing and assembly operations. Clear-cut definitions of responsibility still are forthcoming, but it can be seen that each man will operate in a sphere of his own, with Donner making final top-level corporate decisions.

Observers expect no change in general policies under the new management. GM's decentralization system leaves the various manufacturing and operating divisions autonomous, free to make day-to-day decisions.

Backgrounds and experience of the two new GM leaders reveal what roles they will be playing from now on.

Although Donner is a relative unknown (compared to many other GM executives and heads of other corporations), he is by no means unprepared for his new position. And while he is essentially a financial man (with offices on Wall Street, instead of Detroit), he is by no means an "ivory tower" executive.

Donner has been with GM for 32 years. An economics graduate of the University of Michigan, he joined GM's financial staff in New York City.

But he has taken interest in other phases of the complex and gigantic GM operation. In addition to serving as head of the Financial Policy Committee, he also has been serving on the Operations Policy Committee and the Administration Committee.

For the latter, he was a member of seven of the ten subcommittees known as "policy groups": distribution, engineering, manufacturing, overseas, personnel, public relations and research.

Gordon has worked for no other company since he received his MS in mechanical engineering from University of Michigan in 1923. He started as a laboratory technician with Cadillac Div. that year, subsequently served as motor design engineer, and during World War II worked on aircraft engine development for Allison Div.

In 1946 he became general manager of Cadillac, and a vice-president of GM. In 1951 he became body and assembly group vice president.

Along with these appointments, the board of directors elevated James E. Goodman to succeed Gordon as the body and assembly group vice president. He had been vp and general manager of Fisher Body Div. since 1952.

Edwin C. Klotzburger, a 35-year GM veteran, becomes general manager of Fisher Body Div., succeeding Goodman. Klotzburger formerly was general director of Fisher's facility planning and works engineering section.

Air Suspension Faces Changes After Mediocre 'Trial' Year

Air suspension is due for a major overhauling in 1959 after an introductory year that saw very few customers ordering cars with the new suspension system.

In fact, three makers who offered air suspension on 1958 cars will not make the option available in 1959. In all three lines the installation rate did not approach 0.5 per cent.

Buick is offering an air suspension system with air bags on the rear only and coil springs on the front. The rear-only mounting still provides the self-leveling feature that is considered the major sales point of air suspension.

Another car maker is combining the rear air bags with coil springs so that extra-cost trailing arms will not be required to absorb torque. This should result in a less complex and therefore less expensive installation. Bellows will be used at all four wheels, however.

Cadillac found the best reception to air suspension, with an installation rate of 14.2 per cent during the model year. Buick followed with 10.7 per cent, Oldsmobile with 6.1, Pontiac with 3.5 and Chevrolet with 2.0 per cent of total cars built.

At the Ford Motor Co., the system was not pushed in advertising or sales campaigns. The bulk of the air suspension equipped cars, in fact, were pilot models produced in the early part of the model year.

American Motors, a late-comer with a rear-only system, installed air suspension on 0.04 per cent of its total production.

Chrysler Corp., which did not offer air suspension in any form during 1958, will bring out a rear-only system in 1959 to provide automatic leveling.

(*Turn to page 98, please*)

AVIATION MANUFACTURING

Lockheed's Electra Certified By CAA for Airline Service

Lockheed Aircraft Corp. announced that its turboprop Electra has been fully certificated for airline service by the Civil Aeronautics Administration.

CAA approval culminated a $50 million, three and one-half year program to prepare the craft for commercial operation. The Electra is the first American-built turbine-powered plane to receive CAA certification.

The Electra, which is powered by four Allison engines, cruises at 405 mph and has a range of up to 2500 miles. It is designed to carry up to 99 passengers.

Burt C. Monesmith, Lockheed vice-president and California Div. general manager, said that CAA certification had come five weeks ahead of a schedule laid down two years ago. He said that four planes were used in the tests for a total of 655 flights and that one plane was in the air for as long as 19 hours and 21 minutes in a single day.

The plane was certified for takeoff at 113,000 lb and can use runways as short as 4730 ft.

"This means the Electra can fly to cities where approximately 95 per cent of the world's air traffic originates," Monesmith said.

Bell Reports New Liquid Fuel Increases Rocket Engine Power

Bell Aircraft Corp. announced development of a new space-rocket fuel so powerful that it would be possible to launch satellites "considerably" heavier than Russia's biggest sputnik.

The rocket fuel uses a chemical—liquid fluorine—which is so active that it combines with almost any substance with which it comes in contact. Previously, the volatile fuel has been used primarily in atomic energy applications.

Bell also reported that it developed an experimental rocket engine that can be fired with the new fuel. A company spokesman said this is as significant as the harnessing of liquid fluorine as a rocket propellant.

Ray P. Whitman, first vice-president of Bell, heralded the development as "the last major breakthrough" in chemically fueled rockets. He said the new propellant makes possible a 70 per cent increase in the payload of existing ballistic missiles and of new space vehicles now on the drawing board.

GRUMMAN GULFSTREAM MAKES FIRST FLIGHT

Grumman's new turboprop executive transport, the Gulfstream, made its first flight last month and is now undergoing extensive flight testing. Plane is powered by two Rolls Royce Dat engines with a take-off rating of 2105 hp each and will carry from 10 to 19 passengers. It has a maximum cruise speed of 370 mph at 25,000 ft and a range of 2200 miles. Wing span is 78 ft, 6 in.; overall length, 64 ft; and maximum height, 22 ft, 9 in.

Vertol Aircraft Corp. Gains Contract for 10 Helicopters

Vertol Aircraft Corp. has announced receipt of a military letter contract for the manufacture of 10 new twin-turbine Vertol 107 transport helicopters. The letter contract, awarded by the Navy Bureau of Aeronautics and funded by the Army Transportation Corps, is valued at more than $8 million

The Vertol 107, which the Army has designated the YHC-1, will be powered by two turboshaft engines. Seven of the new helicopters will be equipped with twin General Electric T-58 engines totaling 2050 hp, and three with twin Lycoming T-53 engines totaling 1650 hp.

Kaman Aircraft Makes Pact To Produce Fairey Rotodyne

Kaman Aircraft Corp. announced it has concluded a licensing agreement with Fairey Aviation Co., Ltd. of Hayes, England, to manufacture Fairey's Rotodyne, a vertical takeoff turboprop airliner.

The Rotodyne carries 48 passengers or 12,000 lb of cargo and can operate in and out of confined areas restricted up to now to helicopter operations.

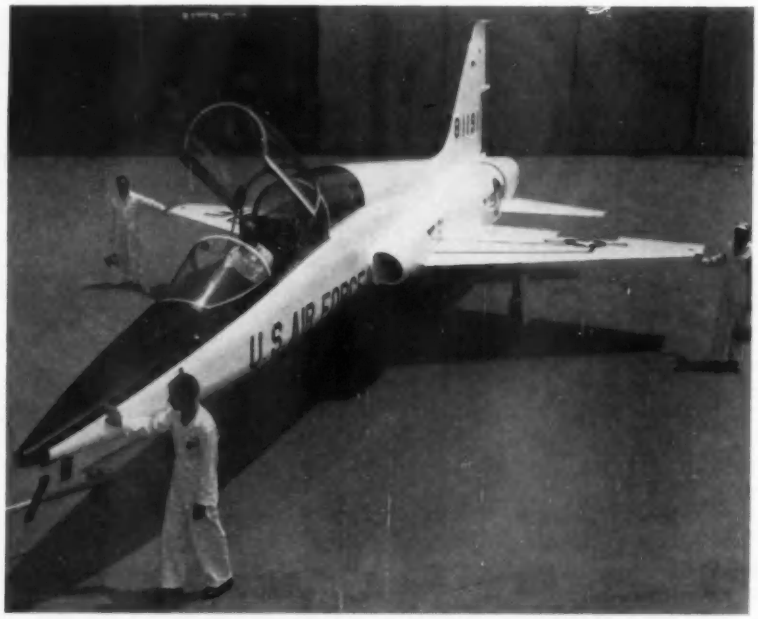
Vertical takeoff of the Rotodyne is powered by four 1000-lb-thrust pressure jets mounted in the rotor blade tips. Forward flight is accomplished by two 3500-hp gas turbines driving two propellers. In forward flight the turboprops take over, while the jets on the tips of the rotor blades are turned off. Lift in forward flight is achieved by the combination of the short fixed wing and the windmilling rotor.

New Fuel-Loading System Cuts Countdown Time for Missiles

A new high-speed fuel loading system for liquid fueled missiles has been developed jointly by Minneapolis-Honeywell Regulator Co. and A. D. Little, Inc.

Designed primarily for the Atlas ICBM, the system is said to shorten the countdown time needed to prepare missiles for ring. It can be modified

AVIATION MANUFACTURING



T-38 ROLLS OUT AHEAD OF SCHEDULE

Northrop Aircraft, Inc. rolled out its first T-38 supersonic jet trainer four days ahead of schedule at Northrop Div. plant in Hawthorne, Calif. The trainer, which embodies the "area rule" design concept, is powered by two General Electric J-85 engines with a high thrust-to-weight ratio. Plane is designed to fill gap between the primary trainer and the Century Series fighters.

to service any liquid-fuel missile, the joint announcement said.

The instrumented system automatically transfers the liquid propellant from launching-base storage tanks to the missile, eliminating the chance of human error.

Heart of the control system is a relay matrix-type sequencer, which monitors the action of other system components. It programs the succeeding steps in the loading system by verifying its own action.

Grumman to Use IBM Computer To Design Future Aircraft

Grumman Aircraft has installed an IBM 704 computer at its Bethpage, N. Y., facility for use in designing and "test-flying" future company aircraft.

Gerald Fogel, head of Grumman's Automatic Computation Section, said that engineers will be able to "ask the machine" what an airplane will have to be like to perform certain tasks, such as flying at speeds of Mach 3 or beyond. By using a "rubber airplane" which might be frozen in the form of one or more possibilities suggested by the machine, he pointed out, the airplane and its performance can be evaluated before intensive design work has gotten underway.

In addition to aircraft and design work, Grumman will use the the computer for missile development and other study programs.

Congress to Make Study in '59 Of U. S. Renegotiation Policy

The House Ways and Means Committee early next year will begin a thorough study of Government renegotiation policy.

Scope, objectives, and procedures of Federal renegotiation of Government contracts will be considered, the Committee says.

Added to the coverage of the Renegotiation Act, which was extended for six months during the last session, is the new National Aeronautics and Space Administration. The law will apply to all renegotiable contracts the new agency takes over from its predecessor, the N.A.C.A.

Cessna Reveals Details of New 2-Place Model 150 Plane

Cessna Aircraft Co.'s new Model 150 airplane, scheduled for October introduction on the commercial market, will be available in three different versions, the company announced.

The new model is designed to meet the need, Cessna said, for a modern two-place trainer, charter, pleasure, and intercity airplane.

The 150 is a high-wing, all-metal single-engine airplane with a maximum recommended cruising speed of 121 mph. It is powered by a four-cylinder Continental 0-200-A engine, has a maximum speed of 124 mph and a range at maximum cruise of 520 miles. Total gas capacity is 26 gallons.

Among the plane's features are nylon tubeless tires, a baggage compartment with 80-lb capacity, and a children's seat big enough to accommodate two small youngsters. The latter will be available in kit form from the factory as optional equipment.

Price for the standard model is $6995, for the trainer, $7940, and for the inter-city commuter, $8545.

Model 150 is designed for training, charter, pleasure, and business flying.

MEN IN THE NEWS

Waldes Kohinoor, Inc., Truarc Retaining Rings Div.—James C. Darby was named general sales manager.

Ford Motor Co.—**J. B. McMechan** has been named manager of the institutional advertising department and **Mott B. Heath** has been appointed manager of the advertising and sales promotion department.

Hoover Ball & Bearing Co., Adrian Div.—**Carl Rhodes** has been named general manager.

Uniloy, Inc.—**Clarence A. Price** was named president.

Tecumseh Products Co.—**Robert G. Krueger** has been appointed director of engineering for the Lauson and Power Products Divisions.

Wagner Electric Corp., Automotive Div.—**A. R. Mackie** has become manager of the Minneapolis branch office.

Dayton Rubber Co.—**Robert G. Burson** has been appointed general sales manager of the Mechanical Goods Div.

Hyster Co., Tractor Equipment Div.—**Paul Hinds** has been named assistant manager.

Norton Co.—**John H. Hartleb** was appointed a field engineer at the Los Angeles District Office.

Doeden Tool Corp.—**Gerald D. Doeden** was made manager of marketing.

Aerojet-General Corp.—**Chester A. Hill** was elected vice-president-assistant treasurer.

Minneapolis-Honeywell Regulator Co., Valve Div.—**Norman A. Fletcher** has been appointed manager of manufacturing.

Purolator Products, Inc.—Howard M. Gammon was named chief engineer in charge of all engineering activities at the Rahway plant, and Frederick R. Gruner has become director of engineering.

Standard Oil (Indiana)—**Robert M. Ladevich** was appointed a senior project automotive engineer and James E. Getz and John V. Peterson were made project automotive engineers at the Whiting Research Laboratories.

Delco-Remy Div., General Motors Corp.—**Russell J. Hulse** has been named director of personnel.

General Tire & Rubber Co., Bolta Products Div.—**Charles J. McCarthy** was named product sales manager in charge of automotive original equipment.

Yates-American Machine Co.—**Donald W. Smith** was named national sales manager of the Heat Transfer Products Div.

The American Brake Shoe Co., Kellogg Div.—**George N. Decker** was named president.

B. F. Goodrich Chemical Co.—**Grover S. Ramsey** has been made sales representative in Michigan.

Heppenstall Co.—**Glenn F. Whiteley** has been appointed manager of the Indianapolis plant.

Alan Wood Steel Co.—**Charles D. Dorworth** has been promoted to assistant to the president.

E. W. Bliss Co., Press Div.—**E. C. DeVault** has been appointed Toledo District sales engineer.

National Lead Co.—Philip W. Ruppert has become manager, metal division, for the Atlantic Branch.

Chicago Pneumatic Tool Co.—J. C. Mabe was elected vice president in charge of plant operations.

Lindberg Engineering Co.—Ray P. Dunn has been named technical director of the Melting Furnace Div.

Timken Roller Bearing Co.—**Jack K. Myers** has been appointed branch manager, and **Horace O. Hunt** assistant branch manager of the Philadelphia office.

Continental-Diamond Fibre Corp.—**Martin D. Blumenthal** has been named to the newly created position of supervisor, materials handling containers sales.

Du Pont Co.—**William W. Wingate** has been named manager of the mid-continent region of the Petroleum Chemicals Div.

Borg-Warner Corp.—**John F. Murray** was named chief product engineer for Pesco Products Div. and Wooster Div.

Joseph T. Ryerson & Son, Inc.—**L. Paul Lee** was named head of the aluminum sales department.

Necrology

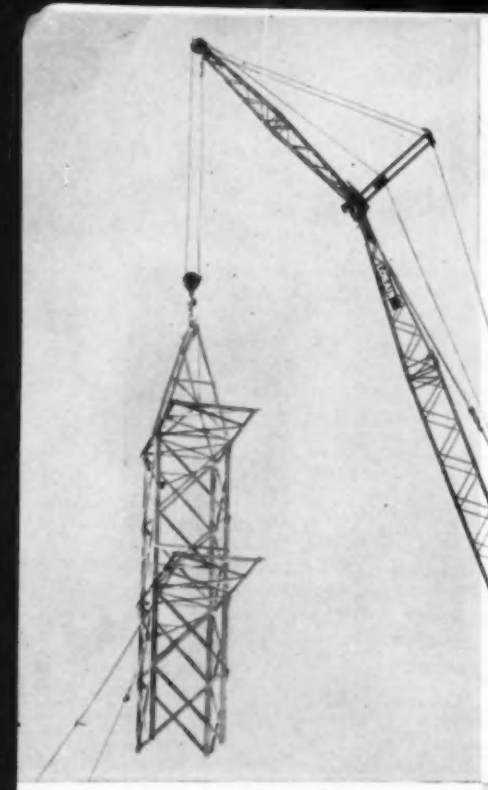
Alonzo W. Peake, 68, a former president of Standard Oil Co. of Indiana, died Aug. 28, at Dundee, Scotland.

Herbert A. Stanton, 71, former president of Norton Behr-Manning Overseas, Inc., and vice-president of Norton Co., died Aug. 26, at Harwichport, Mass.

William J. Durling, 58, former president of Precision Castings Co., died Aug. 22.

Theodore C. Fedders, 64, former president of Fedders Mfg. Co., which became Fedders-Quigan Corp., died Aug. 18, at Buffalo, N. Y.

Alfred R. Schattschneider, 60, president of King Machine Co., died Aug. 12, at Milwaukee, Wis.



NEW THEW-LORAIN

"Square Tubular-Chord" Crane Boom

The Moto-crane, designed and built by The Thew Shovel Company of Lorain, Ohio, offers a uniquely light, powerful, maneuverable boom. Completely fabricated of Shelby Seamless Mechanical Tubing, the boom consists of four main chords of square tubular construction, reinforced by lacing of round tubing. In sizes, the main chords range from 2" x 2" x .189" wall to 4" x 4" x .250" wall.

The advantages of this type of construction are manifold. The square cross section of the four main chord members gives the greatest radius of gyration for column strength, 15% better than round members, 90% better than angles. This radius is the factor that gives square chord sections the greatest column strength per lineal foot of weight. The result is a weight savings of 20 to 30%, greater strength, and increased lifting capacity. It also permits handling and traveling with longer booms.

USS and Shelby are trademarks

Why Shelby Seamless Mechanical Tubing was chosen...

Primarily, it offers the ultimate in strength and rigidity in proportion to its size and weight. Secondly, it is shock-absorbent, uniform throughout, dimensionally accurate, and possesses excellent machining and superior welding properties. It is produced under rigid standards, and is available in a generous range of diameters, wall thicknesses, various shapes and steel analyses.

Contact our engineers. Let them help you to adapt Shelby Seamless Mechanical Tubing to your specifications.

The 35TM Moto-crane unit with straight 105-foot boom and a 20-foot tip extension. Some of these booms have been as long as 200 feet.

National Tube Division of USS United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Supply Division • United States Steel Export Company, New York

HOW MANY WAYS CAN *Special Purpose Fasteners* CUT COSTS FOR YOU?

How many of your products employ laborious, old-fashioned fastening methods where simple fasteners could do the job and cut costs, too? How many parts and sub-assemblies can be adapted to include a self-fastening feature? How many future products could be improved by advance planning for fastener efficiency?

United-Carr's engineering staff offers you a wealth of experience in the design of special-purpose fasteners and self-fastening devices. Large-scale manufacturing facilities (including in-plant plastics molding equipment) ensure economical, *volume* production and prompt deliveries. United-Carr field representatives are ready to call on you at *your* request.

POLYETHYLENE MOUNTING FOOT

No mar, no scratch glide for use on TV receivers, record changers, small appliances, etc. Assembles into round hole in wood or metal cabinets.

NYLON SNAP-IN NUT

Snaps into square hole stamped out of sheet metal . . . provides secure anchorage for any sheet metal or self-tapping screw . . . highly effective electrical insulator.

QUICKEY FASTENER

Eliminates need for welding or swaging studs to sheet metal stampings, facilitates nesting, eliminates damage in transit because Quickey snaps in before final assembly.

THREAD CUTTING FASTENER

Re-usable, self-locking, vibration-proof fastener cuts clean, deep threads on unthreaded chrome-plated studs. Available for ⅛", 5/16" and ¼" studs. Can be driven with standard wrenches.

PLUG BUTTONS

Snap into ⅛" to 3" dia. holes. Can be embossed with ornamental or functional designs . . . various finishes, shapes and sizes.

FISHTAIL RATCHET PLATE

Holds on smooth, die-cast metal or plastic studs to anchor name plates, trade marks etc. on appliances, automobiles, electronic apparatus, etc.

TRIMOUNT STUDS

Hold two or more thicknesses of material together. Easily installed by hand. Insure vibration proof attachment. Permanent or removable. Many shapes and sizes.

V-LOCK TEENUT

Re-usable, self-locking, one-piece, all-metal nut has high tensile strength, is unaffected by heat or oils. In various shapes, sizes and metals.

SOL-A-NUT

Self-locking, rustless, heat resistant. Sturdy, one-piece stainless steel construction prevents corrosion if nicked or scratched.

DURABLE DOT FASTENER

Snap fastener for cloth, leather, plastics and other materials. Positive closure, instant release. Black, nickel or brass finish.

CARR FASTENER COMPANY

Division of United-Carr Fastener Corp., Cambridge 42, Massachusetts

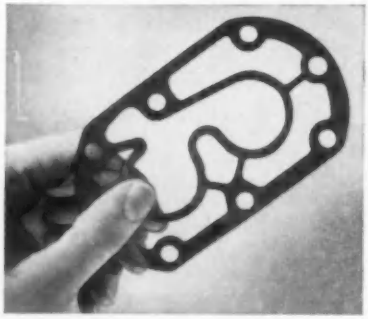
MAKERS OF DOT FASTENERS

Technical data for gasket design and selection

NUMBER FIVE

Choosing a gasket for compressors

In selecting a gasket material for a compressor head, the first consideration is the gasket's ability to withstand the usual ambient temperature of about 300° F.



At such elevated temperatures, and with internal pressures ranging well over 100 psi, torque retention becomes another critical factor.

In the case of refrigerator compressors, the choice of a gasket is further limited by the presence of refrigerant gases which attack many gasket materials.

A material that meets these requirements is Accopac AN-890, a new beater-saturated gasket material pioneered by Armstrong. Accopac AN-890 is a blend of refined asbestos fibers with a nitrile-type rubber binder.

AN-890 withstands temperatures up to 800° F. Its nitrile-type rubber binder swells slightly in the presence of refrigerant gases. Since these gases do not deteriorate AN-890, the swelling acts to maintain a tight seal.

Bolt torque retention of Accopac AN-890 has been proved by comparing a flange containing refrigerant gas at 350° F. and 150 psi, and a control flange at room temperature and no gas. Accopac maintained bolt torque equally well in both flanges.

Because of the thorough refining of the asbestos fibers, AN-890 die-cuts cleanly. It also costs less than conventional asbestos materials.

For more information, write for a copy of our new folder, IND-915.

How heat affects the selection of resilient gasket materials

In selecting a resilient gasket material for use where the temperature at the gasket line will be substantially higher than room temperature, the various effects of heat must be considered.

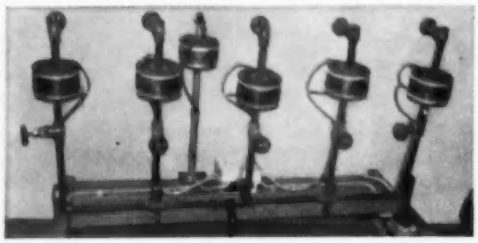
In many cases, heat is less of a limiting factor than is commonly supposed. If a designer knows the range of temperature limits of the various classes of resilient gasket materials (see table), he may find that a resilient material offers service equal to a more expensive gasket.

A more subtle effect of heat—and one more difficult to detect—is the softening it tends to produce in almost any non-metallic gasket.

Generally, this is manifested by things variously known as torque loss, stress relaxation, and creep. Because of plastic flow or some form of fatigue, high temperatures tend to reduce the ability of a resilient gasket to maintain flange pressures over relatively long periods.

Loss of bolt torque induced by heat can be minimized by selecting a gasket material with good torque retention properties. The Armstrong Accopac line includes several such materials. Generally, the denser the gasket the better its torque-retention properties, (see table). In addition, where heat is involved, it is all the more important that initial bolt loads be adequate.

A more complete discussion of the effects of heat on resilient materials is contained in the new Armstrong Gasket Design Manual. Write for your copy today.



This apparatus—called the "hot spider"—permits simultaneous testing of gasket materials at temperatures up to 750° F. and internal pressures up to 500 psi under varying conditions of flange loading.

Class of material	Maximum sustained temperature at gasket line*	Rank in order of torque retention
Asbestos	750° F.	1
Cellulose	300° F.	2
Cork-and-rubber	250° F.	3
Straight rubber	250° F.	4
Cork composition	250° F.	5

*These are recommended design limits. Obviously, in many applications temporary exposure to higher temperatures can be tolerated. Consideration should also be given to nature of contained fluids, since some fluids which are inert at room temperature become more active as temperatures increase.

Resilient gaskets usually are organic, and exposure to high temperatures can cause physical damage such as charring. If charring does occur, the damage will, of course, be obvious and leaks will result. This can generally be avoided by staying within recommended limits of the material or by using an inorganic gasket such as Armstrong asbestos Accopac.

Send for a copy of the new Gasket Design Manual, IND-763, containing 34 pages of valuable information for engineers. Armstrong Cork Co., 7009 Imperial Avenue, Lancaster, Penna.

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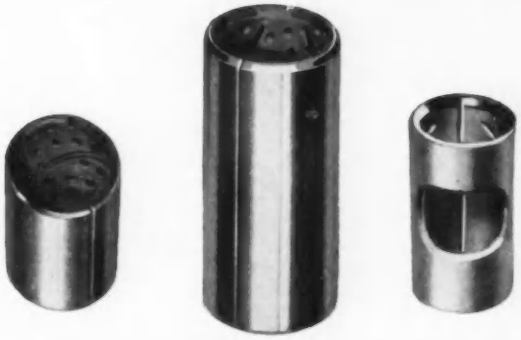

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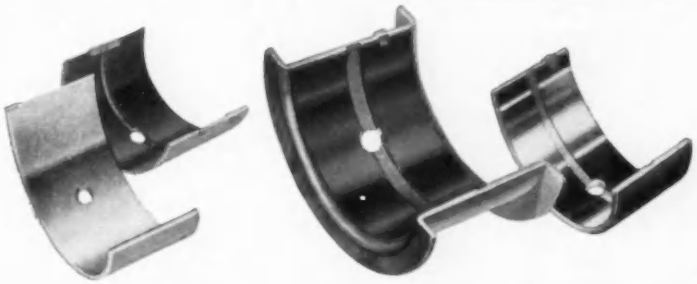

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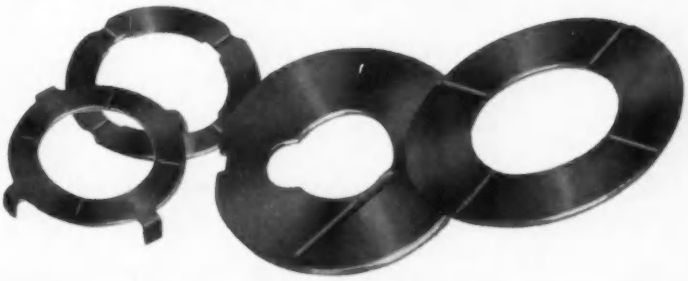

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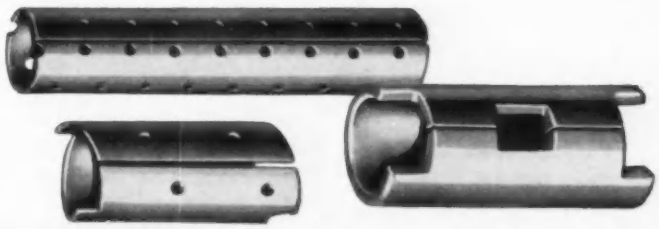

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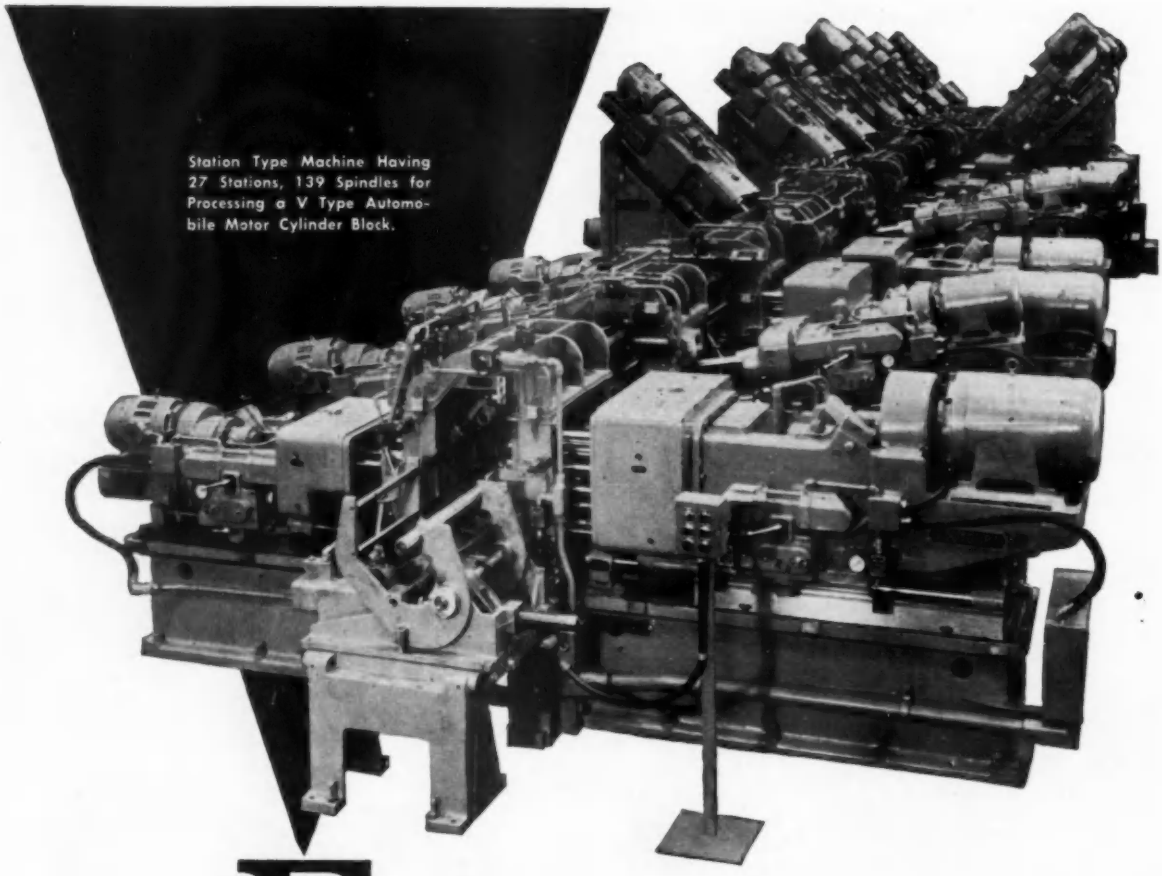

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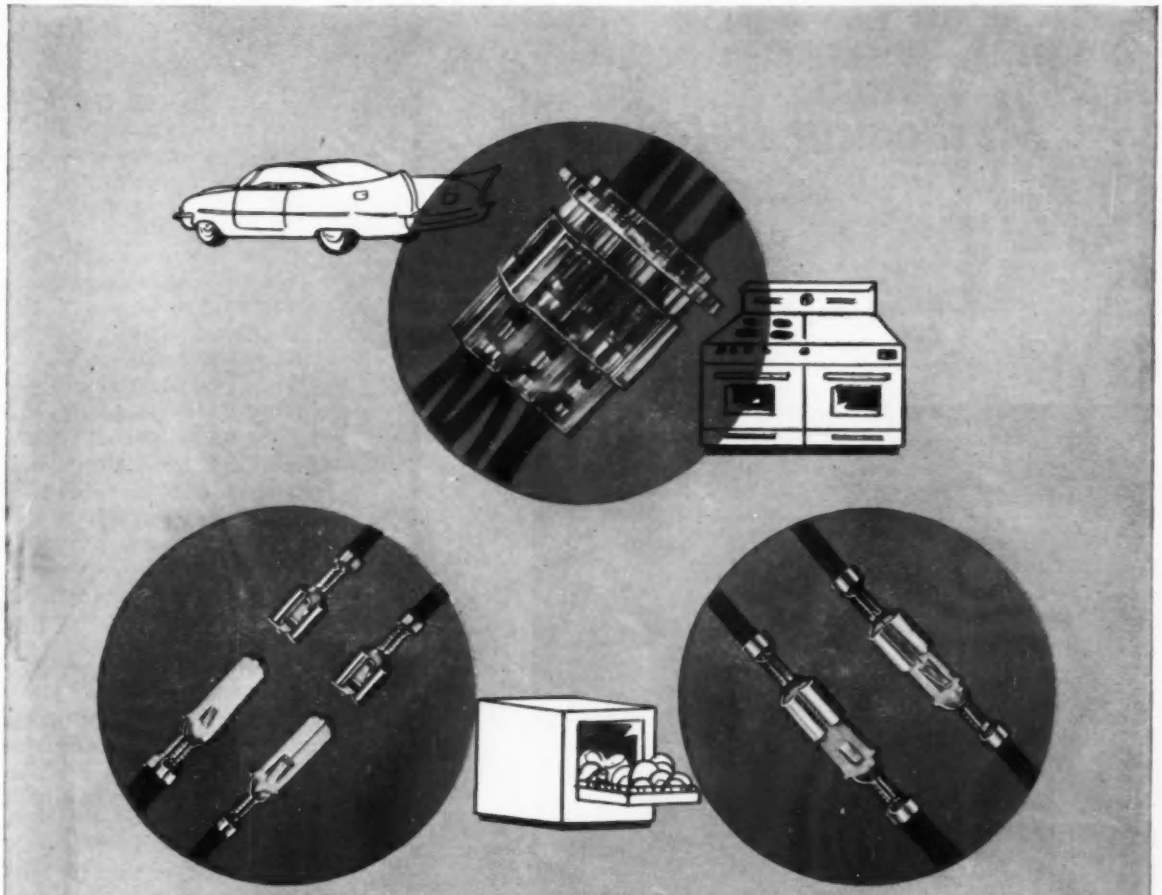

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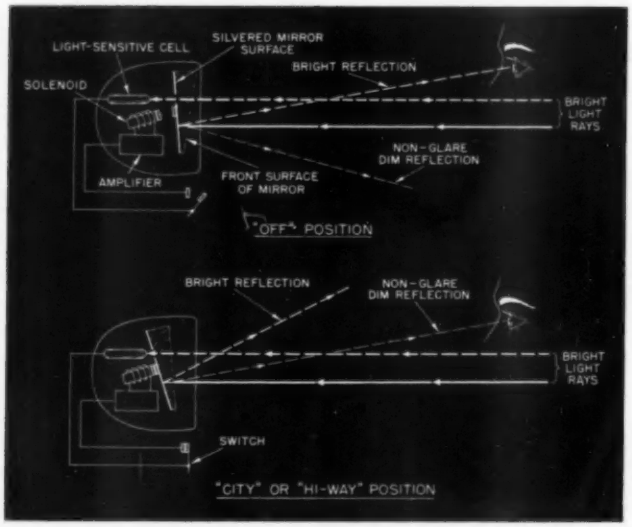
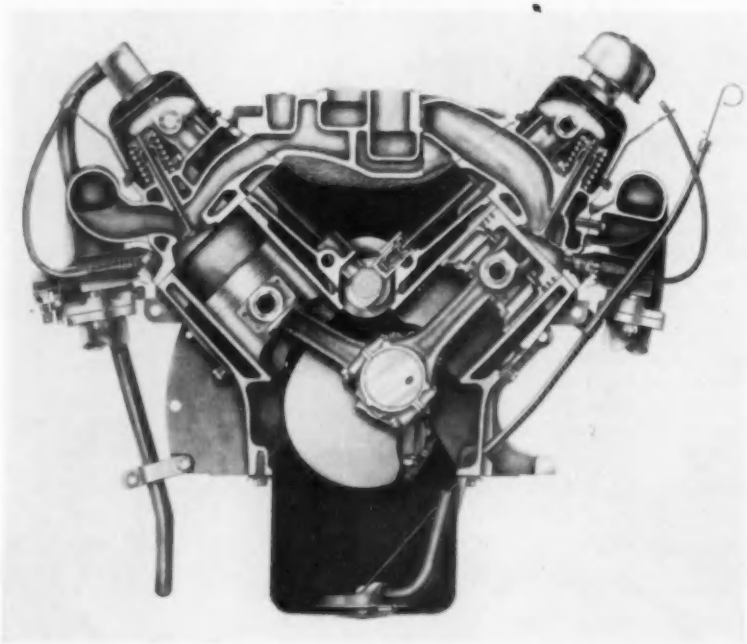
Mechanical Details of
Chrysler Corporation's 1959 Cars



Mirror-Matic electronic rearview mirror



1959 Chrysler engine

IT is reliably reported that for its 1959 line of cars Chrysler Corp. has some 30,000 new part numbers, body changes representing about 80 per cent of this number. Sheet metal styling changes, therefore, are considerable and account for a drastic change in eye appeal for the model year. This article is concerned exclusively with the highlighting of mechanical features common to the Chrysler Corp. family. Appearance changes will best be appreciated when photographs and descriptive material are issued by individual divisions.

From the standpoint of mechanical features, perhaps the most important is found in the new alignment of engines. Although horsepower and torque ratings will not be revealed until each division makes its own announcement, the general line-up of engines will be found in the table. Engine availability has been changed materially with the introduction of two new powerplants — 383-cu in. and 413-cu in. displacement, respectively. As indicated in the table, the 383-cu in. engine is available in the Dodge and DeSoto line, on specified models; and on the Windsors, and Saratoga models in the Chrysler line.

The 413-cu in. engine is found on the New Yorker, the Chrysler 300E, and the Imperials.

The basic 230-cu in. 6-cylinder L-head engine which is available with a single-barrel carburetor on the Plymouth, now is offered on the Dodge Coronet Six with a two-barrel carburetor.

Chrysler now offers an optional equipment air suspension in which air springs, applied only at the rear, are utilized in conjunction

with leaf springs. Low rate leaf springs support most of the weight while the air springs carry the remainder. Thus air springs are employed primarily to provide automatic car leveling.

At the same time some significant improvements are evident in the Torsion-Aire front suspension system. These include: a camaction adjustment providing an infinitely variable setting of caster and camber; new suspension ball joint design having self-sealing characteristics as well as improved lubrication; and a change to shorter and more efficient torsion bars.

Principal elements of the air suspension system are: a high pressure air compressor, located in the engine compartment; a storage tank at the front end; a low pressure air reservoir above the rear axle; rubber and nylon air springs; and a height control valve.

With the introduction of engines of higher ratings, the TorqueFlite transmission has been treated to increased torque capacity. This is effected mainly by increasing the torque capacity of the rear clutch element.

For 1959 Chrysler will offer a full line of high performance prestige cars, available as two-door hardtops or convertibles. This includes: the Plymouth Sports Fury, powered by the 361-cu in. V-8 with a four-barrel carburetor; Chrysler 300-E, powered with the 413 cu in. V-8 engine with two, four-barrel carburetors; DeSoto Adventurer, featuring the 383-cu in. V-8 engine with two four-barrel carburetors; Dodge D-500 with 383-cu in. V-8's. The D-500 engine has a four-barrel carburetor and dual exhaust, while the Super D-500 has the same engine with two four-barrel carburetors, special camshaft and dual exhaust system.

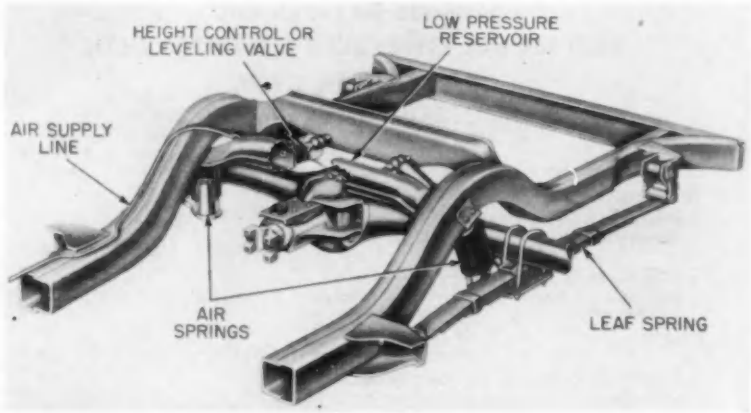
Considered to be a major advance in comfort is the introduction of Chrysler swivel seats which are standard equipment on Plymouth Sports Fury models, DeSoto Adventurer, and Chrysler 300-E. They are offered as optional equipment on Dodge Custom Royals, DeSoto Firedomes and Fireflites, and in all models of Chrysler and Imperial. They are not available on station wagons.

Two new safety electronic accessories are offered as optional equipment on all cars—and automatic electronic headlight dimmer, and an electronically controlled self-dimming inside rear view mirror. The headlight dimmer utilizes transistors, a miniaturized electronic circuit, and an electronic

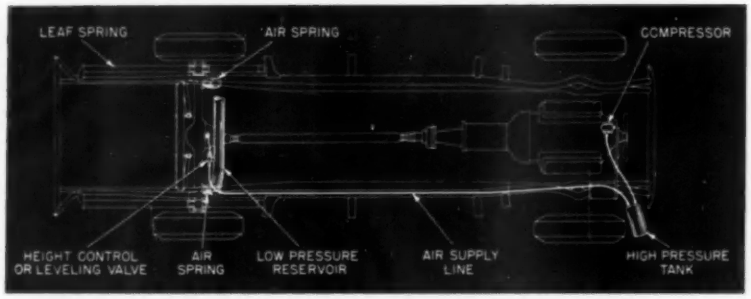
ENGINE DETAILS ON 1959 MODEL CHRYSLER CORPORATION PASSENGER CARS

MAKE & MODEL	ENGINE TYPE	BORE & STROKE (Inches)	DISPLACEMENT (Cubic Inches)	COMPRESSION RATIO
PLYMOUTH				
Available on Savoy and Belvedere models	POWERFLOW SIX L. Head. Single throat carb. is standard	3.25 x 4.63	230	8.0
Available as standard V-8 on Savoy, Belvedere, Fury and Sport Fury models	FURY V-800 Two-barrel carb. is standard. Super-Pak with four-barrel carb., and special camshaft are standard on Sport Fury; optional on all other models	3.91 x 3.31	318	9.0
Available as optional V-8 on all Plymouth models	GOLDEN COMMANDO Four-barrel carb., dual breaker distributor, heavy duty valve springs and dampers, and special camshaft are standard	4.12 x 3.38	361	10.1
DODGE				
Available on Coronet models only	"GET-AWAY" SIX L-head. Single throat carb. standard	3.25 x 4.63	230	8.0
Standard V-8 on Coronet models	RED RAM V-8 With two-barrel carb. standard	3.95 x 3.31	326	9.2
Standard V-8 on Royal models and Sierra Station Wagons	RAM FIRE V-8 Two-barrel carb. standard	4.12 x 3.38	361	10.1
Custom Royal models and Custom Sierra Station Wagons	SUPER RAM FIRE V-8 Four-barrel carb. standard	4.12 x 3.38	361	10.1
Available as optional V-8 on all Dodge models	D-500 V-8 Four-barrel carb. standard	4.25 x 3.38	383	10.0
Available as optional V-8 on all Dodge models	SUPER D-500 V-8 Two four-barrel carbs., special camshaft, valve springs, dampers, air cleaners and distributor	4.25 x 3.38	383	10.0
DE SOTO				
Standard V-8 on Firesweep models	TURBOFLASH V-8 Two-barrel carb. standard	4.12 x 3.38	361	10.1
Standard V-8 on Firedome models	TURBOFLASH V-8 Two-barrel carb. standard	4.25 x 3.38	383	10.0
Standard V-8 on Fireflite models	TURBOFLASH V-8 Four-barrel carb. standard	4.25 x 3.38	383	10.0
Adventurer (Optional on all De Soto models)	ADVENTURER V-8 Two four-barrel carbs., special camshaft, distributor, air cleaners, valve springs and dampers	4.25 x 3.38	383	10.0
CHRYSLER				
Standard V-8 on Windsor models	GOLDEN LION 383 Two-barrel carb. Dual exhaust standard on convertible	4.03 x 3.75	383	10.0
Saratoga	GOLDEN LION 383 Four-barrel carb., and dual exhaust standard	4.03 x 3.75	383	10.0
New Yorker	GOLDEN LION 413 Four-barrel carb. standard	4.18 x 3.75	413	10.0
300E	CHRYSLER 300E Two four-barrel carbs., special air cleaners, camshaft, distributor, valve springs and dampers	4.18 x 3.75	413	10.0
IMPERIAL				
All models	IMPERIAL V-8 Four-barrel carb. standard	4.18 x 3.75	413	10.0

NOTE: Dual exhaust available as standard or optional equipment on all V-8 models.



Chrysler front air suspension



Schematic view of air suspension system

eye. The rear view mirror has a prism which flips automatically to cut out annoying glare from the headlights of following cars.

A foot dimmer switch overrides the automatic headlight control at the will of the driver. A feature of the system is the location of the scanner directly ahead of the driver where it is aimed through an area of the windshield kept clean by the windshield wiper. Placement of the scanner over the instrument cluster was made possible by the development of an extremely small electronic eye, the scanner and its aluminum housing being only 3/4 in. in diameter and 3 in. long.

The self-dimming rear view mirror is a development of Chrysler engineering. It consists of a prismatic mirror in combination with a photoelectric cell, a miniaturized electronic circuit, and an electromagnet.

Design features of the new Chrysler and Imperial engines include a deep-skirted block, wedge-shaped combustion chambers, one-piece rocker arms, and in-line overhead valves with hydraulic lifters. The new design features have made possible a weight reduction of over 100 lb for the 413-cu in. engines.

A new feature on all engines is a specially tuned air cleaner which is said to eliminate harsh carburetor and engine breathing noise.

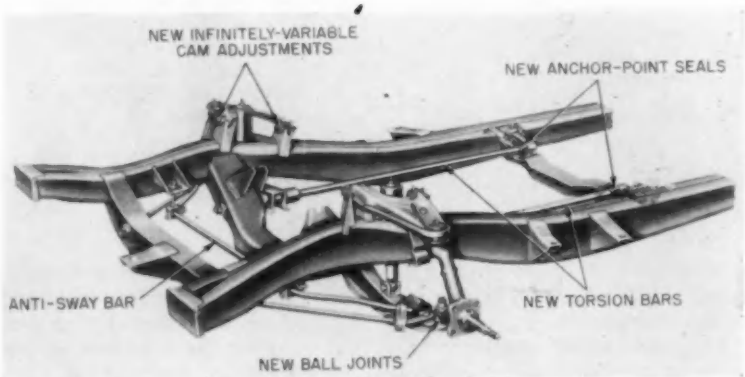
A new cooling system is used on Chrysler and Imperial cars, requiring only 16 quarts of coolant, compared with 25 quarts used heretofore.

Another important feature of the 413-cu in. engine is the added rigidity stemming from an unusually heavy and rigid crankshaft, having a journal overlap of almost one inch. Servicing of these engines has been greatly simplified. The distributor, spark plugs, and other electrical components now are more readily accessible. In addition, the oil pump is externally mounted and an oil filter of throw-away type is located on its front end where it can be replaced by hand.

All divisions offer optional equipment engine packages which include special accessories such as four-barrel and two four-barrel carburetors, dual exhaust systems, special camshafts, distributors, valve springs and dampers.

For 1959, Chrysler will stress fuel economy which is available by specifying an economy rear axle at no extra cost. Fuel economy gains up to 10 per cent are promised, with an economy axle with ratio of 2.93 to 1, and improved carburetor, available on all TorqueFlite transmission cars.

Finally, it may be noted that push-button controls now are used for operating all heaters, whether hot water or gasoline type, and for all factory-installed air conditioning systems. Adjacent to these buttons is a small sliding lever which sets the temperature at the desired level. ■



1959 front suspension

Heat Treating Steering Gear Parts

Ross Gear and Tool Co. Heat Treats Large Numbers of Components in a Single Cycle

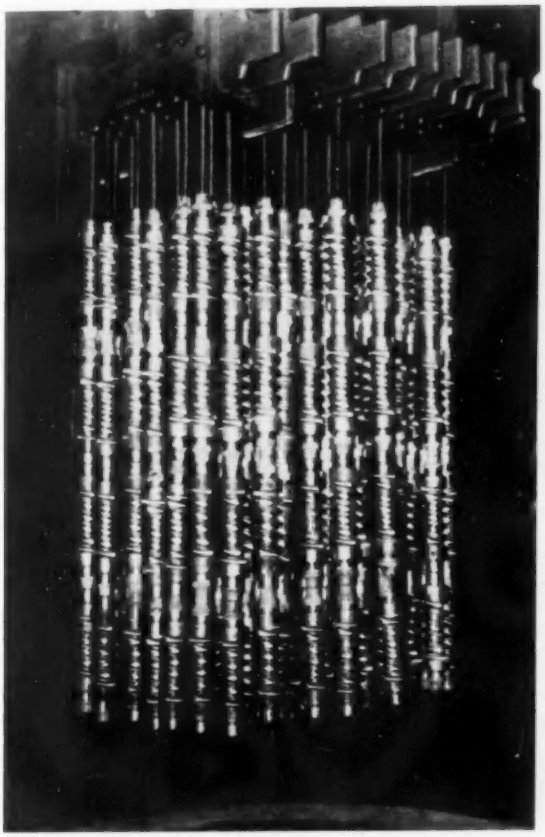
ENGINEERS at Ross Gear and Tool Co., Lafayette, Ind., were faced with two problems: how to heat treat large numbers of automotive steering assembly parts in a single cycle, and how to get longer life from a heat treating fixture that is exposed to highly corrosive gas atmospheres, abrupt changes in temperature and heavy loads. Working in cooperation with the design department of a high alloy foundry specializing in heat resistant castings, Ross engineers solved both problems by the use of a unique high alloy cast fixture of articulated design.

Carburizing of Steering Gear Parts

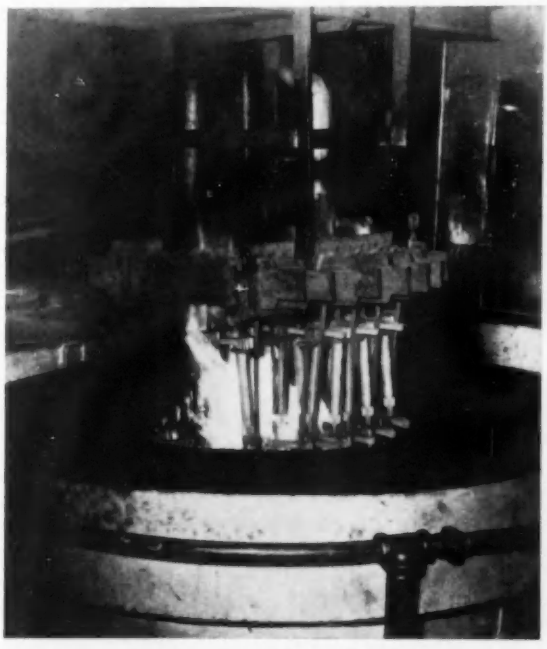
Ross carburizes approximately 300,000 to 400,000 lb of steering assembly parts each month. Of all the parts that go through the carburizing cycle, the worm type cam is handled in greatest volume. Made of alloy steel bar stock, SAE 8620, the cams are strung on rods and suspended from the special cast heat resistant alloy fixture. Vertical suspension of these otherwise hard-to-handle parts must be maintained by the fixture throughout cycles of long exposure to high temperature and thermal shock during sudden quenching. The fixture must not distort under these severe operating conditions, yet must support a heavy load—about 1500 lb net in the case of the cams—during each furnace cycle.

At the start of the carburizing cycle, the fixture with the cams is lowered into one of four radiant tube pit-type controlled atmosphere furnaces, built by Surface Combustion Corp. About two and one-half hours are required to bring the furnace and load up to heat; in a typical cycle, the cams are held at 1700 F for eight and one-half hours. The furnace temperature is then lowered to 1575 F and held at this temperature for one hour to equalize the work temperature. During the entire furnace cycle, a carburizing medium consisting of 265 cu ft per hour of an enriched RX atmosphere (CO_2—less than 0.1%, CO—18%, CH_4—2%, H_2—42%, dew point about +10 F) is used; this includes 15 cu ft per hour of

(*Turn to page 96, please*)



Suspended from cast alloy fixture, steering cams are strung on rods prior to carburizing.



Load of gear shafts on cast high alloy fixture is direct quenched in oil. Method of suspension from the fixture is somewhat different from method for cams.

The Electra four-door hardtop features a wrap-around rear window

1959 BUICK

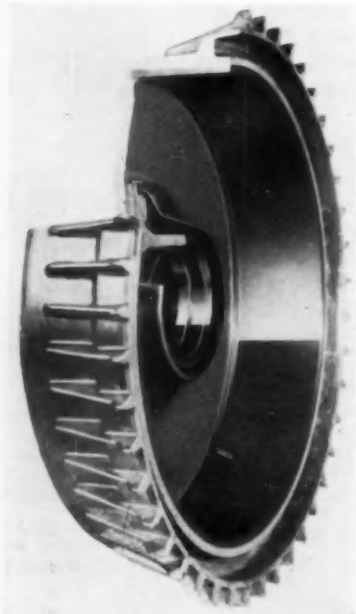
New Line of Cars With Different Model Designations and Larger Engine in Top Three Models

FIRST in the industry to make its 1959 announcement, Buick boasts an entirely new line, consisting of four series, each one bearing a new designation. Thus Buick marks a complete break with tradition. From a styling standpoint Buick offers dramatic lines with accent on the dominant dynamic line running downward from the crown of the front fender without a break to the rear of the rear fender.

From the standpoint of mechanical features, Buick has two engines, the 364-cu in., used across the board last year, now standard only on the series 4400; and a 401-cu in. engine for the top three models. The frame is entirely new, and many other details such as brakes and suspensions have been improved.

The line-up of models is as follows: LeSabre, Series 4400 and the Invicta, Series 4600, mounted on 123-in. wheelbase; the Electra 4700 and Electra 4800 on 126.3 in. wheelbase.

The aluminum brake drum—standard on all series at the front has been improved by a new method of bonding the liner to the drum. An uninterrupted braking surface is provided by the new design.



Each series includes in its body styles a thin pillar, 4-door sedan and 4-door hardtop, the sedan model in the Series 4800 being of stub pillar type. Each of the 4-door hardtop sedans features the "greenhouse" wrap-around rear glass treatment.

An important change for 1959 has been made in the optional air ride system. The new suspension retains coil springs at the front with self-leveling air springs only at the rear.

The number of powerplant combination options has been increased. Standard on Series 4400 is the 364-cu in. engine with synchromesh transmission, two-barrel carburetor, single exhaust system, and 3.58 to 1 ratio rear axle. However, three special options are available for this series. First is the same engine with 2-barrel carburetor and single exhaust, coupled with a Twin-Turbine transmission and 3.07 to 1 ratio rear axle. Second is a "Power Pack" option, consisting of the 364-cu in. engine with four-barrel carburetor and dual exhaust system, coupled with a Twin-Turbine transmission and 3.23 to 1 ratio rear axle. Then there is the "Power Pack" package consisting of the same engine with four-barrel carburetor and dual exhaust, coupled with the Triple Turbine transmission and 2.78 to 1 rear axle ratio.

On Series 4600 the standard powerplant system consists of the 401-cu in. engine with four-barrel carburetor and single exhaust, coupled with Twin Turbine transmission and 3.23 to 1 ratio rear axle. Here too are special options. First is dual exhaust. Then there is the "maximum economy" package with dual exhaust, coupled with Triple Turbine transmission and 2.78 to 1 ratio rear axle.

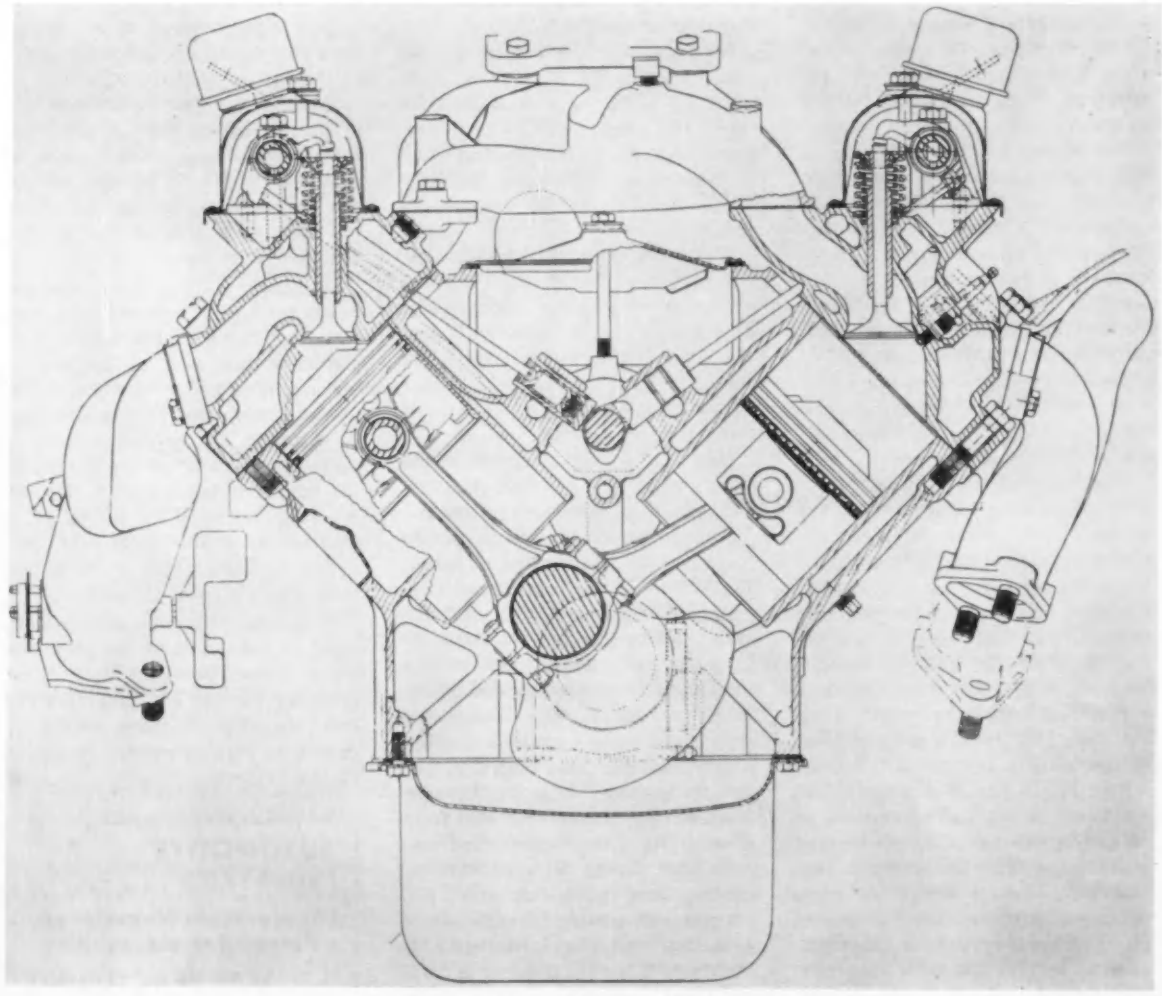
The standard powerplant system for the Series 4700 and 4800 is the same as for the 4600, except dual exhaust is standard equipment. The only option on these is a "maximum economy" package, consisting of dual exhaust, and Triple Turbine transmission coupled with a 2.78 to 1 ratio rear axle.

Coming to the details of the engine, the 364-cu in. engine remains substantially the same, except that compression ratio has been upped to 10.5 to 1 on all cars equipped with Twin- or Triple-Turbine transmissions. With the standard synchromesh transmission compression ratio is 8.5 to 1.

For maximum economy, a smaller venturi, two-barrel carburetor is employed, calibrated to operate as leanly as possible.

Engine breathing is improved with the adoption of 1.500-in. diameter exhaust valves and an increase in the size of exhaust passages in the cylinder head on both engines. On turbine-transmission cars valve lift has been upped by a new camshaft and a 1.6 to 1 rocker arm ratio on both engines.

The larger, 401-cu in. engine, shown in cross-section, has some special features. The cylinder block is designed to handle the increased loading. Cylinder deck height from the crankshaft center line is increased by 0.240 in. To protect against oil leaks, the crankshaft thrust bearing has been moved from the rear to the center main bearing. Main bearing caps have a deeper section to resist the increased loading. The crankshaft provides for the longer stroke and



Transverse section of the new 401 cu in. engine

1959 BUICK ENGINES

(OHV V-8)

	Series 4400	Series 4600 4700 4800
Bore (in.)	4.125	4.1875
Stroke (in.)	3.4	3.640
Displacement (cu in.)	364	401
Compression Ratio (when turbine trans. equipped)	10.5	10.5
Bhp (max.)	250 @ 4400 rpm	325 @ 4400 rpm
Torque (lb ft) max.	384 @ 2400 rpm	445 @ 2800 rpm
Carburetor (std.)	2 bbl	4 bbl
Pistons	Aluminum alloy, cam-ground, transverse slot, divorced skirt	

has carefully formed fillet radii to improve fatigue life.

A longer connecting rod—6.220 in.—provides the same piston-to-counterweight clearance as in the 364-cu in. engine. New pistons and rings, and longer piston pins are employed. Piston skirt stiffness has been increased and the ribs revised.

The oil pan has been changed on both engines to reduce capacity to four quarts. New cylinder heads incorporate 1.500-in. diameter exhaust valves on both engines. Both intake and exhaust valves are redesigned to provide additional room for the valve springs. In addition, valve springs are redesigned because of the increase in valve lift.

A new distributor body and clamp permit the interchangeable use of these parts on both engines.

The dual exhaust system uses four less hangers and two less joints. Mufflers and tailpipes are either of aluminum- or zinc-plated materials with mufflers of double-wrapped construction; mufflers and tailpipes for the single system being made of the same materials. Ball joints are continued but have a reversed ball at the manifolds to maintain tightness under higher temperatures.

The Triple Turbine transmission, available as optional equipment in all series, has a new second turbine blade form. The transmission case and bell housing are a one-piece permanent mold cast aluminum part. Other parts made from die-cast or permanent mold aluminum castings include the rear bearing retainer, clutch pistons, rear support, and valve body. Use of aluminum has reduced the weight of this transmission to approximately 30 lb less than the Twin Turbine unit.

All clutching elements of the transmissions are of friction plate type, including neutral, drive, reverse, and grade. The latter is the downhill retarder clutch and may be engaged at any vehicle speed up to 45 mph to attain control on grades.

Wider frames with boxed-in side rails are used for 1959. They are made in two basic types — coil spring cars have a frame with conventional spring seats, while air ride cars have frames with a rear spring cross member which is open above the spring seats.

One of the sales features is the adoption of the positive traction differential as optional equipment.

Aluminum brake drums at the front become standard on all series. However, the construction has been materially improved by bonding the high pearlitic iron liner to the drum by a special process. This results in a metallurgically bonded structure having better dimensional stability, a smooth braking surface, improved peak heat transfer, and greater physical strength. To complement the features of the front drums. Buick has introduced cast iron rear drums with 60 external cooling fins, with improved performance stemming from the added radiation and air turbulence. In addition, there is an increase of 47 per cent in usable brake lining thickness. Better weather sealing of rear brakes will be effected by adopting the same double-enveloping rim seal design as used on the front drums.

Power steering is standard on Series 4700 and 4800, optional on the 4400 and 4600. Overall steering ratio remains the same at 19.7 to 1. However, the unit is of rotary valve inline type. Initial hydraulic response is obtained with but 0.3 deg of wheel movement, while driving effort has been reduced to a range of but one to 2¼ lb. Parking effort too has been reduced to 3¼ lb.

With the installation of a transistor type radio and new heater motor, less current is required, making it feasible to use a 35-amp generator. This is supplemented with a single-contact type voltage regulator in conjunction with a fuse at the battery terminal.

The new air ride suspension has a variable spring rate at the rear. Spring rates have been reduced to about 55 per cent of coil spring suspension for a distance of about one inch each side of the normal designed trim height.

Design pressure in the air springs is 100 psi. Air is supplied by a system comprising an air compressor, a storage tank, and valving, to provide a modified closed system. While all air discharged from the springs is returned to the compressor, a certain amount of air is lost when the engine is not running. Height control is effected by means of a single control valve at the rear, connected through a link to the torque tube where it joins the axle.

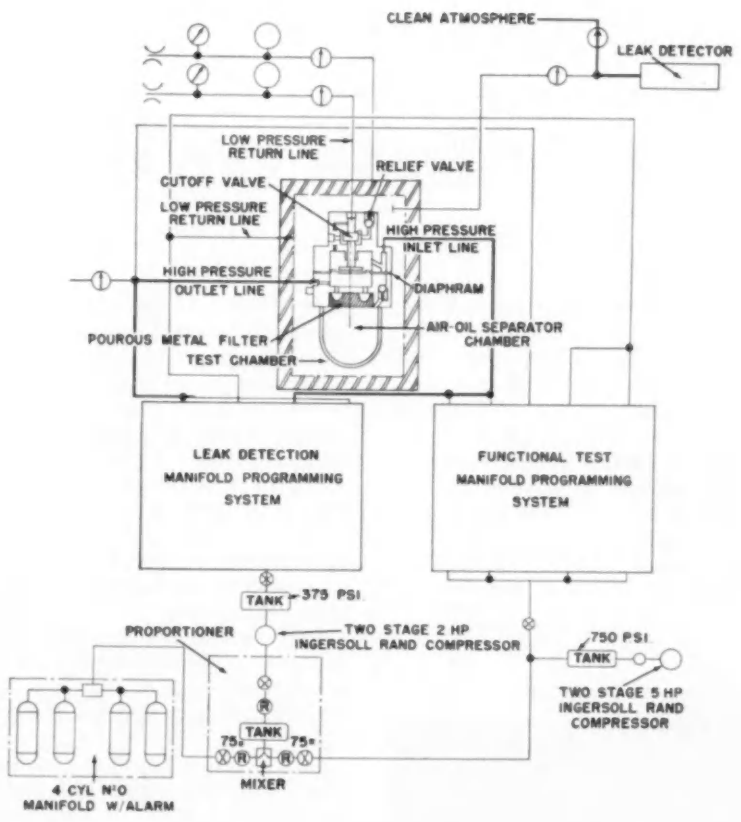
A manual shut-off valve is supplied to take care of the situation when a rear tire goes flat. After lowering the car and removing the jack the shut-off valve should be opened to resume normal operation of the system. ■

AUTOMOTIVE INDUSTRIES . . .

Is your News Magazine of Automotive and Aviation

MANUFACTURING

Automatic Testing of Air Suspension System Components



High pressure air and nitrous oxide are throttled to 75 psi and mixed in the proportioner to a resultant 10-per cent nitrous oxide. This ten-per cent nitrous oxide is re-compressed by a two-stage air-cooled Ingersoll-Rand compressor. Valves and regulators in the test program manifold select the desired passages and throttle the gas to pre-selected pressures. Test probes engage port combinations to not only test internal-to-external leakage but also check against leakage from one internal section to another.

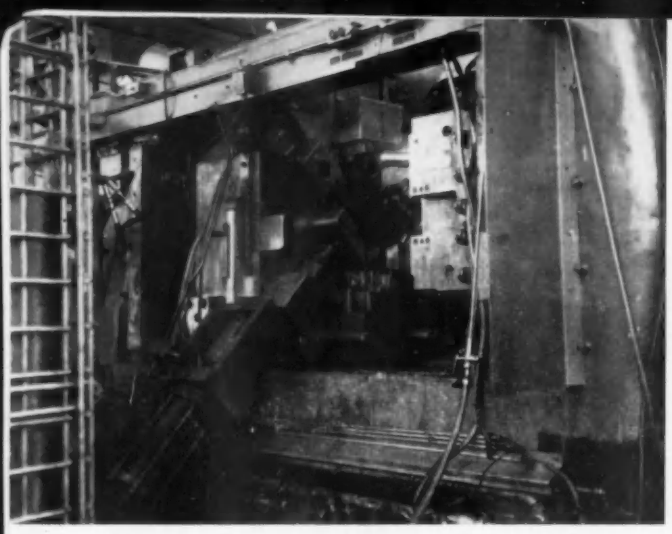
THE multiple-chamber air-oil separator of the closed-type air suspension system built by AC Sparkplug Division of General Motors posed many difficult obstacles to testing it automatically. Engineers at Jered Industries, Inc., Hazel Park, Mich., overcame these hurdles with a dual-compressor pneumatic system that functionally tests under simulated road conditions and detects extremely small leaks—four cubic inches per hour — between any chambers or internal to external. The engineers used two high pressure compressors—one to recompress a nitrous oxide-air trace gas mixture and the other to supply functional test air and compressed air for mixing with the nitrous oxide. Both two-stage aircooled compressors are manufactured by Ingersoll-Rand Co., New York. A Type-30, 4 & 1½ x 3½ five-horsepower compressor delivers 6.5 cfm of functional test air at 800 psi. A smaller 3 & 1¼ x 2¾ two-horsepower unit compresses a 10 per cent mixture of nitrous oxide and air to 375 psi for use in leak detection.

Each air-oil separator is functionally tested by valving, timing and pressure conditions automatically selected to simulate actual road conditions.

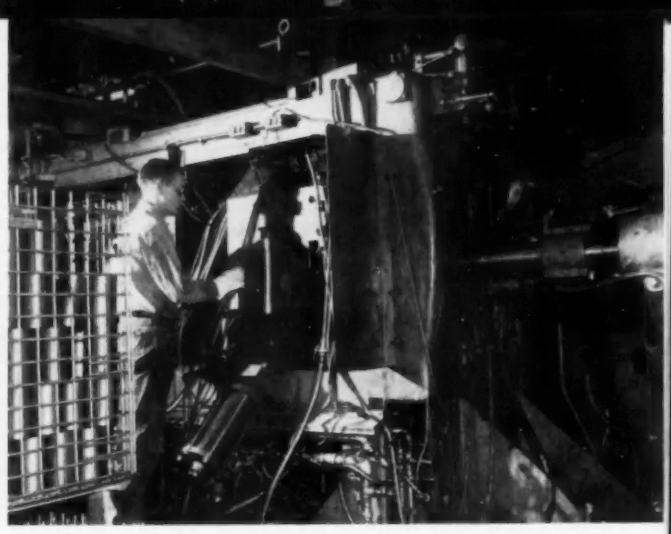
The air-oil separator is positioned in an explosion proof test chamber, air cylinders advance probes into selected ports in the test piece, and automatic valving sequences the pressurization of the desired chambers. At each test stage the air-cylinder driven probes engage a different combination of ports.

The five-horsepower two-stage compressor delivers air at 750 psi for all functional tests. Regulators in the functional test programing manifold throttle delivery pressure down to the individual test levels desired.

(*Turn to page* 94, *please*)



Dies open, the 800-ton diecasting machine is ready to begin cycle.



The die closes, and molten aluminum alloy is injected into it

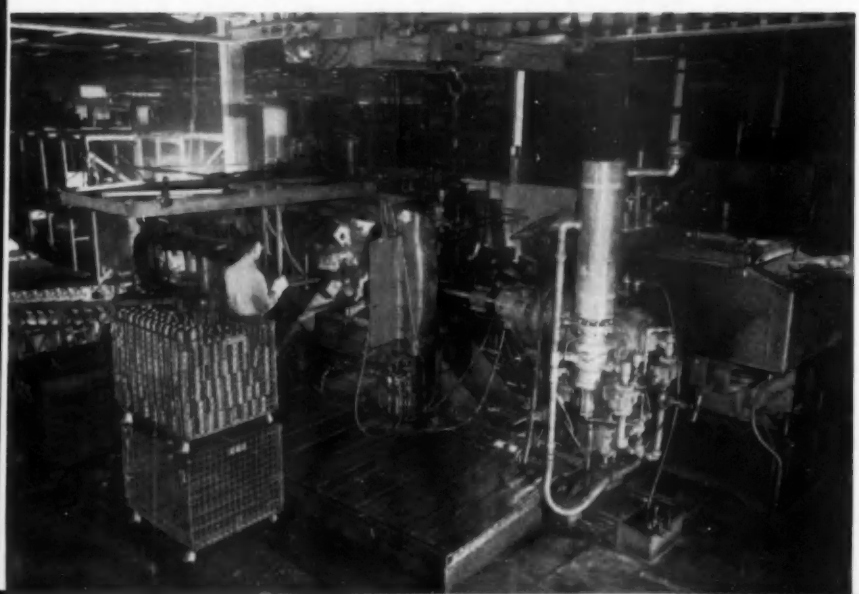
Die Casting Cylinder Blocks and Heads

OUTBOARD Marine Corp., one of the country's leading producers of small internal combustion engines, includes in its line of marine outboard motors two four-cylinder V-type, 50 hp engines, of 70.7 cu in. displacement. The rated horsepower is developed at 4000 rpm. They have a 3-in. bore and 2½ in. stroke. Weight of the complete outboard engine unit is about 200 lb, varying from 197 lb to 208 lb in the styles offered.

In order to hold weight to this minimum, and to obtain best corrosion resistance, the entire cylinder block is a single die casting in aluminum alloy. Left and right cylinder heads are also diecast aluminum alloy. Die casting produces a clean, close-tolerance piece with inserts in position, so that subsequent machining is held to a minimum. The work is done in the corporation's large diecasting plant at Waukegan, Ill., where 35 hp engine blocks are similarly die cast in one piece, along with blocks for smaller engine sizes.

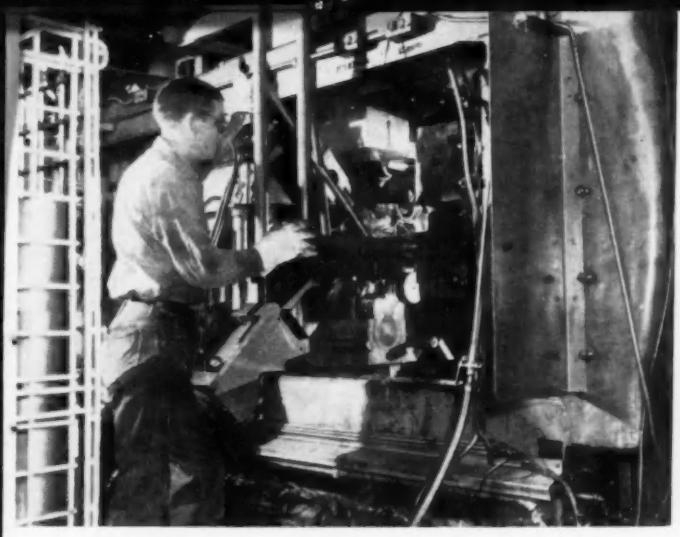
The corporation makes up its own aluminum alloys, based upon 9 to 12 per cent silicon for fluidity, with a few per cent of copper for hardness and strength. Melting is accomplished in nine 200 kw furnaces and nine 72 kw furnaces, and the molten metal then goes to the holding pots at each diecasting machine. The diecasting plant uses about 3 million lb of aluminum alloy per month at present rates of production.

The cradle swings out to a conveyor that moves the block to a cleaning table

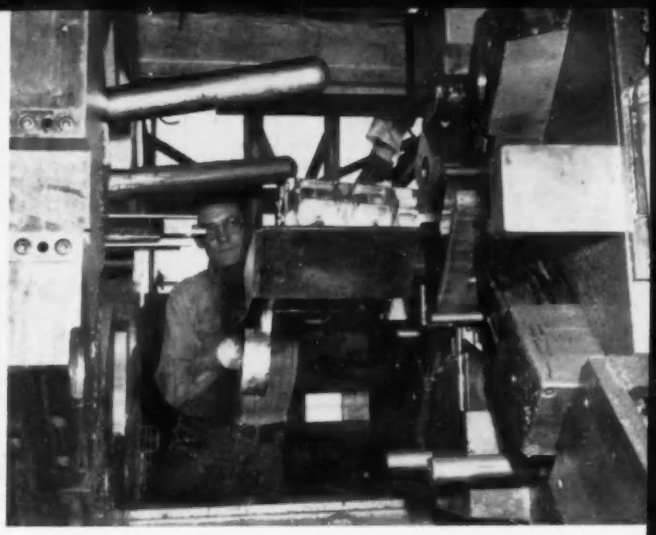


The block for the 50 hp engine, the largest die casting now being made at the plant, is cast in a Lester-Phoenix 800-ton machine. The cylinder liners, which are centrifugally cast gray iron, are placed as inserts in the diecasting operation, as is the bronze center bearing for the crankshaft. The five inserts total about nine pounds in weight.

In the diecasting operation, the die cavity is cleaned and prepared with an oil-graphite mist. The four cast iron cylinder sleeves are hand placed over four steel cores in the die, and are preheated electrically to minimize differential thermal



The die opens, with the casting shown in the center



Engine block casting is picked up by cradle swung into machine axis

for 50-Hp V-4 Engines

By Kenneth Rose

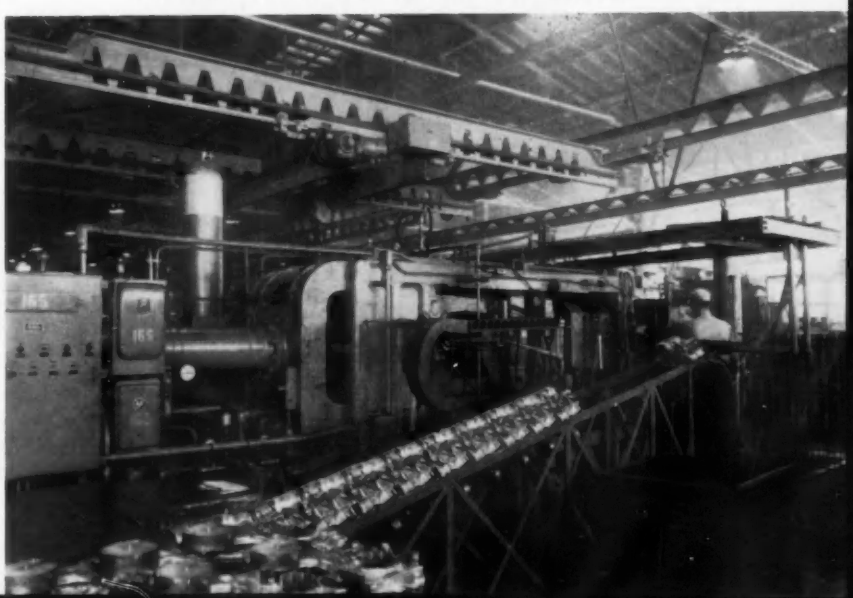
shrinkage in the casting. On some of the other engine blocks, the sleeves are preheated by gas. The bronze center bearing is then hand-placed in the die, positioned by locating pins, and the die is closed.

For the actual casting process, a special automatic ladling device measures 27¾ lb of molten aluminum from the holding pot at 1170 F into the hot chamber, and the ram then injects the molten metal into the die cavity. This shot is measured accurately to within an ounce or two. The dies are water-cooled. After the few seconds for cooling, the die is opened, the cores retracted, and the casting is removed from the die by knockout pins operating in two stages. A cradle swung from an overhead rack is moved into the line of travel of the ram, the hot casting is slid onto the cradle, and the cradle rolls out to one side of the machine to dump the casting down an incline to the inspection table. At this point the casting weighs nearly 37 lb, including 9 lb of inserts and 27¾ lb of aluminum. The aluminum includes about 6½ lb of "biscuit" and gate sticks, afterward trimmed off in cleaning and returned to the melting furnaces.

After passing visual inspection, the casting goes into a tote box, and then to another table for snagging. The cleaned casting next goes to a gang drill, where water passages and locating holes are drilled out as the piece is held in a succession of fixtures. A vapor degreaser removes all oil and dirt remaining from the cleaning and machining. A cleaning and deburring in a Wheelabrator Tumblast follows, using fine steel shot as the cleaning medium. This completes operations.

Die casting of the cylinder heads follows standardized procedure. Two cylinder head castings are required for each engine, and these are cast in a 600-ton Lester-Phoenix machine. Heads are cast one at each shot, for which four pounds of aluminum are injected into the die. The cleaned weight of the cylinder heads is 2.567 lb for the left head and 2.525 lb for the right head. ■

The blocks cool as they move down the conveyor



Making Transmission Parts at Ford's Livonia Plant

By Joseph Geschelin

OUT of the complex of producton operations at the Ford Livonia transmission plant, we have selected two components—the Lincoln output shaft and the dual-range planetary support—for special attention. Not only are they among the parts most recently tooled, they also embody some particularly noteworthy examples of processing.

OPERATIONS ON OUTPUT SHAFT

Starting as a forging, the output shaft is milled at the stem end to length and has both ends centered in a Davis-Thompson double-end machine. Length is held 26.282-26.262 in. overall. The flange then is rough-faced on both sides and the OD of the flange turned in an 8 by 34 in. Model LQ Seneca Falls tracer type lathe.

One of the noteworthy operations is the finish-turning of the steady rest spot about midway from the stem end. Turning is done at a high rate in a 5 by 34 in. Model LR, cam-operated Lo Swing lathe at a speed of 1070 rpm, feed rate of 0.012 in. per revolution, with depth of cut varying up to 3/16 in.

This prepares the output shaft for rough-turning of the stem end and semi-finish facing of the stem side of the flange in a big, Reedmatic (Reed-Prentice) automatic tracer lathe. Here again is an exceptionally fast cycle: speed, 1500 rpm; feed rate varying from 0.020 to 0.022 in. per revolution; and depth of cut varying up to 3/16 in. The machine is fitted with three tool holders: one tool for rough-turning the long stem end; a rear slide with a tool that comes in to finish the radius between the shaft and flange; and a third tool for profiling the stem side of the flange.

ILLUSTRATIONS ON OUTPUT SHAFT

Finish-turning of the steady rest spot on the Lincoln output shaft is done in this LeSwing Model LR lathe at a speed of 1070 rpm, feed rate of 0.012 in. per revolution, with depth of cut varying up to 3/16-in.

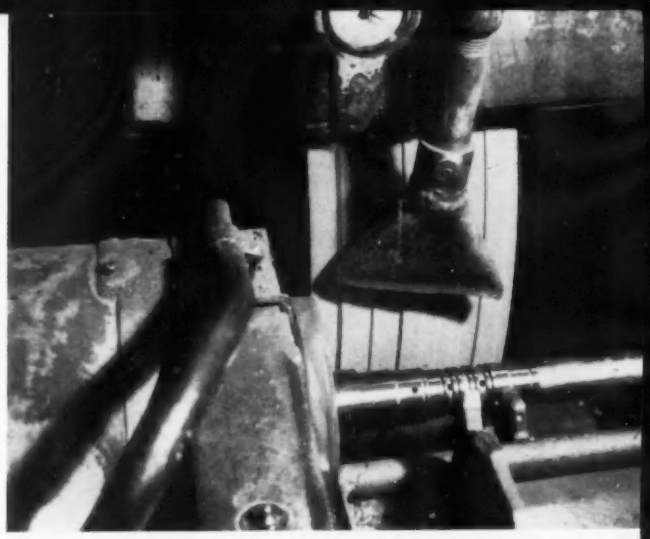
The deep cavity on the flange end is finished in two operations in No. 88, 8-spindle New Britain automatic chucking machines. The first one drills the center holes, rough-faces and turns the flange. The second machine semi-finish-drills and reams the center hole, semi-finish-faces and finish-turns the flange. It may be noted that the center hole operation is performed with a "Christmas tree" type combination tool.

This is followed by semi-finish-turning of the stem and facing of the stem side of the flange in another Reedmatic, heavy duty tracer controlled lathe. Now the stem section adjacent to the flange has six, stepped bearing diameters. These are green ground with a plunge cut, using a formed wheel, in a special 4-BG-1 Van Norman, single-bow gage wheel head grinder.

The grooves in the six stepped diameters, as well as the grinding reliefs, are produced in a plunge cut in a 12 by 33 Fay automatic lathe. For this purpose, the lathe is fitted with four tools in the front slide, nine tools in the rear slide.

Next comes the rolling of the 31-tooth splined section on the stem end. This is done in a No. 1551 Michigan Tool Roto-Flo spline rolling machine, served by Gear-O-Mation to produce a completely automatic cycle of feeding, unloading and delivery to the next operation.

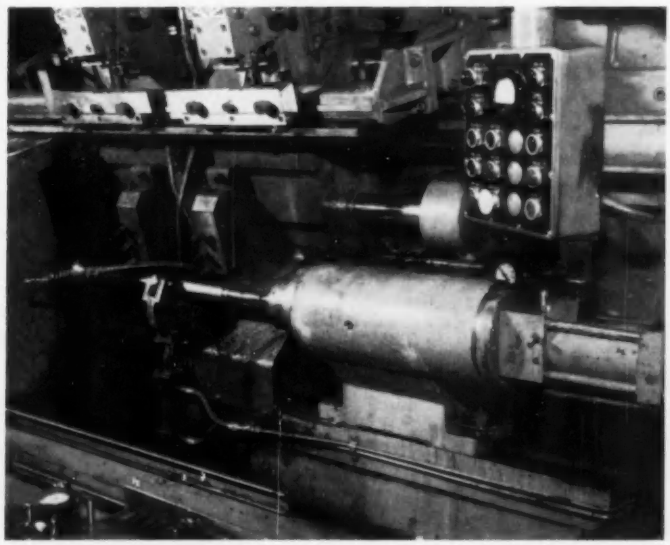
The periphery of the flange end has 83 helical teeth which serve as the ring gear, having an OD of 6.026-6.023 in. These teeth are cut in a vertical type No. 7A-6 spindle Lees-Bradner hobbing machine. Final



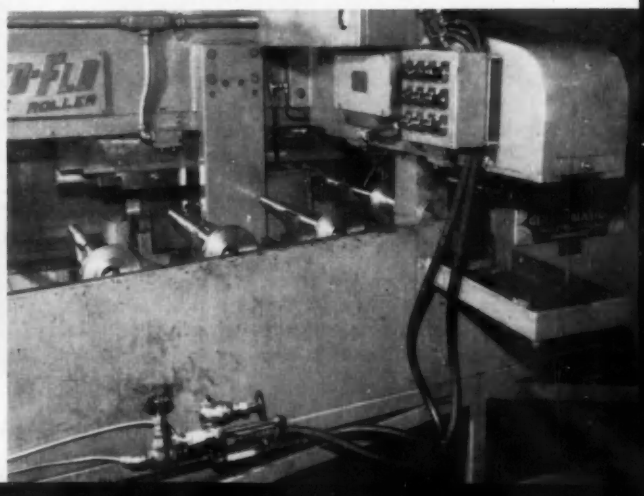
Close-up of 10 by 30 in. Landis grinder which finish-grinds the six bearing steps on the output shaft in a single plunge cut.

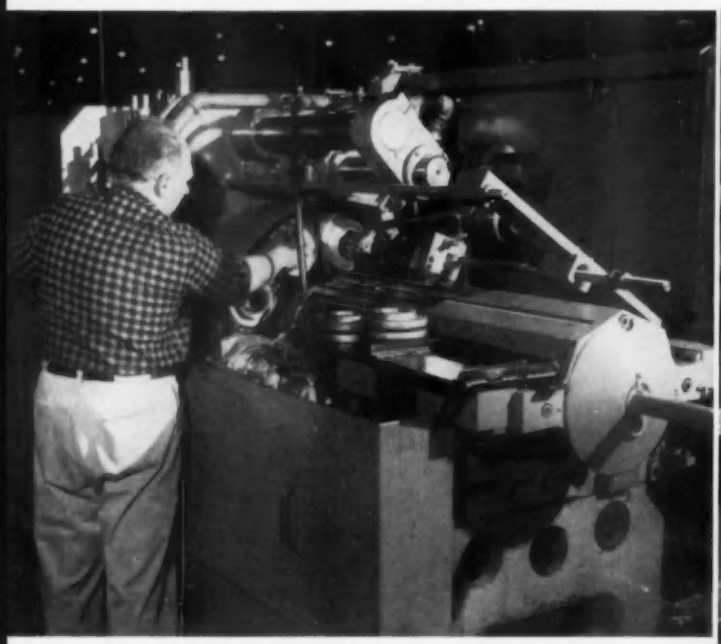
Final operation, in the green, on the output shaft is the drilling of 12 holes and chamfering of six cross holes, plus milling of a Woodruff keyway, all done in one setting in the special Lamb machine shown here.

Rough-turning of the stem end and semi-finish-facing of the stem side of the flange are handled in a Reedmatic automatic tracer lathe. Note the steady rest aligned on the spot previously machined.



Close-up of the No. 1551 Michigan Tool Roto-Flo spline rolling machine. Equipped with Gear-O-Mation for automatic handling of the output shaft, this machine rolls 31 splines on the stem end.





ILLUSTRATIONS ON DUAL RANGE SUPPORT

The dual range support, which starts as a forging, is rough-machined in a group of Model 88, New Britain 8-spindle chucking machines in a double-index cycle. A feature of this setup is the variety of tools required to do the job, together with extremely rapid chip removal.

Following preliminary machining the dual range support is induction-hardened in the Westinghouse machine seen here. It may be noted that the hardening pattern takes in the periphery of the small diameter as well as about half-way along the face of the hub. The hardened section thus is wedge-shaped, tapering to the junction of the hub and web.

operation in the green is the drilling of 12 holes and chamfering of six cross holes plus the milling of a Woodruff keyway, all done in one setting in a 16-station indexing type Lamb drilling and milling machine.

The shaft now is transported to the adjacent heat treating department where the parts are processed through a Surface Combustion atmosphere carburizing furnace. Then they are oil-quenched, washed and drawn. This treatment produces a case depth of 0.035-0.045 in. with a surface hardness of R_c 58 minimum. Shafts are checked for runout, straightened if necessary, and given a Magnaflux inspection.

Detail grinding operations are handled in sequence in Landis, Norton, and Cincinnati grinders of various types. One of the more critical steps takes place in a 10 by 30 in. Landis grinder which finish-grinds the six bearing steps in a single plunge grind with a multiple wheel. The problem here is that the various diameters are held to a tolerance of plus or minus 0.00025 in. Due to differences in wheel diameters as well as the random break-down of individual wheels, the machine is manually operated and must be stopped manually at the right time. To this end, it is necessary for the operator to scan a large air gage and stand in readiness to cut off the operation as the size tolerance is approached. This is simple to do since the air gage is so calibrated that a one-time space equals 0.001 in.

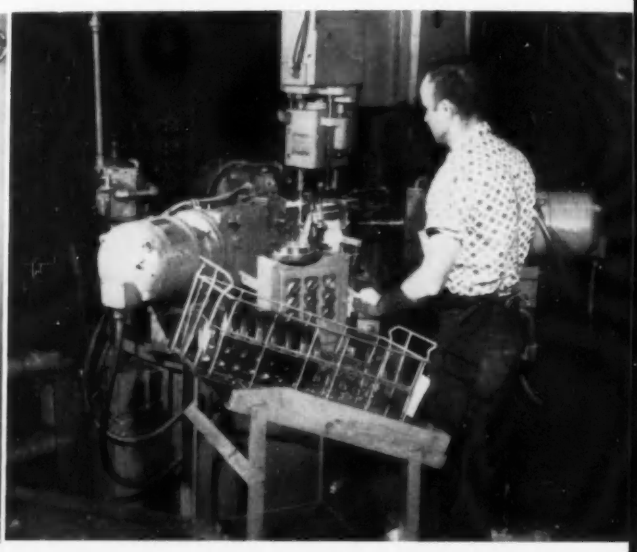
Another extremely critical operation is performed in a Hoern & Dilts (New Britain) Model B-8-6 vertical, indexing type grinder. Here it is necessary to rough-, semi-finish- and finish-grind the outer thrust face of the flange so it is flat within 0.0005 in. total indicator reading, runs true within 0.0005 in. per inch radius, and with a surface finish of 30 microinch, maximum.

The bores in the flange end are finished in two settings in Heald No. 272 precision, internal grinders; then the larger (1.750-1.751 in.) bore is honed to a surface finish of 7-microinch in a Model No. 723 Micromatic Hydro-Honer. Finally the 2.1840-2.1835 in. diameter on the stem is superfinished to a 7-microinch finish in a Model 15-Z-A Gisholt hydraulic cylindrical type Superfinisher.

OPERATIONS ON DUAL RANGE SUPPORT

The dual range support, the other component to be described here, starts as a forging of SAE 1052 steel but as it is progressively machined it turns out to be a highly difficult part to handle in mass production. It may be visualized as a drum with a small diameter hub and a comparatively thin web or dia-

After hardening, the dual range support is brought back to form and correct height by pressing in this Denison press.



As mentioned in the text, one of the most difficult operations to control is the drilling of three holes in the flange and two holes in the web after the part has been hardened. The operation is performed in a Kingsbury drill, using twist drills with flutes of double-margin type.

phragm connecting the two cylindrical sections. It requires meticulous handling in the green to hold concentricity as well as dimensional accuracy. But when the machined part is heat treated and induction-hardened it distorts in every direction. As will be shown later, it is necessary to press the part back to form and size, then to impose a series of corrective grinding operations. Because of heat distortion some operations which ordinarily would be done in the green are handled in the hard condition. And this is particularly true of some drilling operations to be mentioned later.

Perhaps the biggest metal removal job takes place at the first operation on the machine line—roughing, semi-finishing, and turning the face—in New Britain Model 88, 8-spindle chucking machines of double-index type. While the tool layout on these machines includes some 27 different throwaway tool bits, by far the most oustanding feature is found in the variety of tool tips necessary to do the job properly. They vary in size as well as in shape, as follows: three triangular tips—5/16, ½, and 9/16 in. inscribed circle; two square tips—⅜ and ½ in.; a number of diamond-shaped tips; two octagon tips—½ and ¾ in. inscribed circle; and several odd-shaped forms. Chip removal is quite rapid considering the heavy cut taken in the rough forging, the work being run at 194 rpm with feed rate of 0.010 in. per revolution.

The first corrective operation is the finish-turning of the hub OD, and large OD, facing the end of the hub, and other details. This is done in a two-spindle New Britain precision boring machine. Then four oil holes are drilled in a Kingsbury. The work is washed, inspected, and routed to the heat treating department.

First the part is hardened and drawn to R_c 30-40 for core strength. Then it is selectively induction-hardened in a Westinghouse unit, and stress-relieved. By this time the diaphragm has warped and the work-piece is usually well out of alignment. Most of the distortion is corrected by pressing the part back to its proper height in a 25-ton Denison hydraulic press. To this end, the work is located with the flange of the large OD resting on the die face, pressure being applied on the face of the hub. This height is gaged to 1.223 in. The work then is given a Magnaflux inspection. From this point on all machining operations are done in the hard state.

The first of these is the finish-facing and semi-finish-boring of the small ID, and turning of the large ID. This is done in a two-spindle New Britain precision-boring machine. Bore of the small ID is held to 3.304-3.308 in. For this purpose the work is run at a speed of 450-600 sfpm with feed rate of 0.010 in. per revolution.

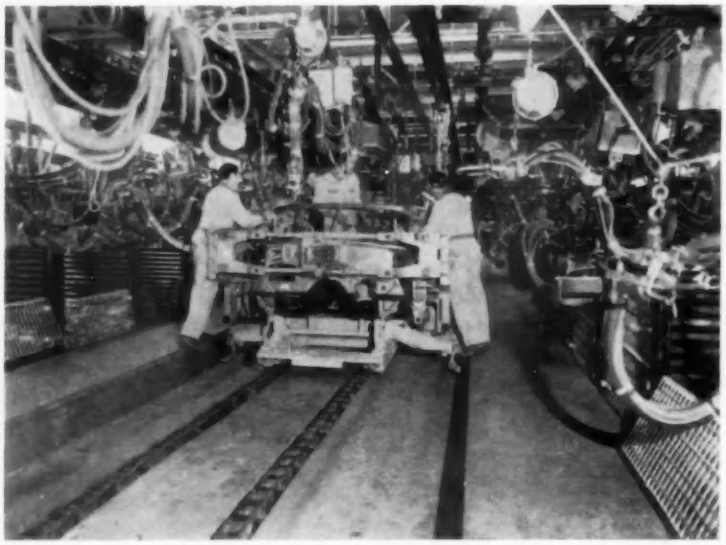
The small ID then is finish-ground in a Heald internal grinder, holding size to 3.3130-3.3135 in. The OD of the hub as well as the adjacent thrust face are ground in a special angular slide Cincinnati No. 2 chucking grinder.

One of the more difficult operations is the drilling of three, 0.291-0.296 in. holes in the periphery of the outer flange, and two, 0.250 in. holes in the web. Obviously, the difficulty arises from the fact that drilling is done on hard surfaces. Another complication is that the holes in the flange run part way into the web. Nevertheless, the job seems to be done quite readily with the use of National twist drills with flutes of double-margin type suitable for accurate guiding in the drill bushings. Drilling is done at 35 sfpm with feed rate of 0.003 in. per revolution.

This is followed by other finish-grinding operations after a bushing has been pressed in place. ■

Mercury's Rivera Assembly Plant

Eight Hundred Cars Are in Various Stages of Production at One Time in New Facility Which Has Approximately 150 Floor Conveyors



The body of the Mercury begins to emerge on this 325-ft long "gate line" where side panels are attached.

Traffic through first half of trim department is controlled from this master control console. It is the operator's job to transfer bodies from one operation to another. Ten pushbuttons at front of panel control live roll and lift tables which lift body from side transfer conveyor and move it at right angles onto one of the trim or storage conveyors, or vice versa.

THE AUTOMOTIVE assembly line has been brought to one of its most advanced forms in the Mercury plant at Rivera, Calif., about 11 miles southeast of downtown Los Angeles.

In this plant each car is built to an individual order, and the cars that roll successively off the assembly line are a mixture of all of Mercury's body styles, basic colors, and choices of upholstery.

Eight hundred cars are in various stages of completion at any given time, and it is entirely possible for each of these 800 units to be different from all the others. With such accessories and optional equipment as power brakes, power steering, air conditioning, electric antennas, etc., the possible combinations become almost endless.

The plant in Rivera, which serves 13 western states, Hawaii and Alaska, replaces a Mercury plant built only in 1948, five miles away in Maywood.

The assembly plant spreads over a 200-acre site, some six times the area of the former Maywood location. There are 31.8 acres of floor space in the 13 buildings on the property. The main assembly building is 1150 ft long and 765 ft wide, with a partial second floor of 222,750 sq ft devoted to painting operations.

Link-Belt Co. supplied the complete system of floor conveyors—some 150 conveyors of various types which stretch for 3½ miles throughout the plant, plus 133 pieces of related equipment such as turntables, transfer tables, hydraulic live roll and lift tables and body elevators.

These conveyors carry frames,

(*Turn to page* 90, *please*)

Trends in Use of Selected Equipment on Passenger Cars

THE popularity of "optional" or "special" equipment items on new passenger cars is shown in the accompanying tables. A similar table for 1957 model passenger cars also is shown for comparison.

1958 MODEL YEAR

Percentage, Factory Installations Only

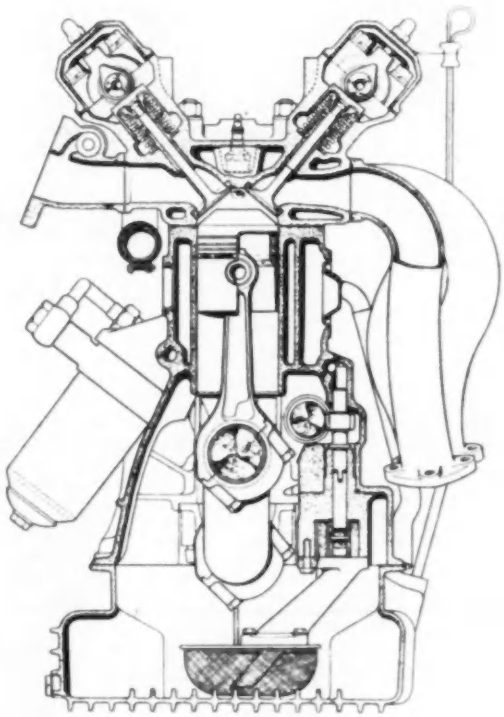
	Ford	Lincoln	Merc.	Edsel	Plymouth	Chrys.	Imp.	De Soto	Dodge	Cad.	Olds.	Buick	Chev.	Pontiac	AMC	Stud.-Packard
Automatic Trans.	69.1	STD	94.2	91.9	78.6	99.9	100.0	99.5	96.8	100.0	98.9	98.5	68.7	97.0	49.3	41.1
Standard Trans.	25.8	NA	4.8	6.1	19.7	0.1	NA	0.5	3.2	NA	1.1	1.5	29.1	3.0	29.6	33.4
Overdrive Trans.	5.1	NA	1.0	2.0	1.7	NA	NA	NA	NA	NA	NA	NA	2.2	NA	21.1	25.5
Power Brakes	8.4	STD	39.2	43.3	15.9	80.5	100.0	69.6	35.3	100.0	86.6	80.3	13.0	54.0	22.8	9.7
Power Steering	27.5	STD	50.5	48.7	33.9	97.4	100.0	90.3	65.3	100.0	85.9	69.2	24.1	54.0	17.1	14.6
Power Seats	1.4	62.0	7.9	7.6	0.7	27.1	93.5	11.1	3.2	74.8	19.4	14.1	0.5	2.4	NA	0.46
Power Windows	1.2	85.0	6.6	5.6	1.0	16.2	92.9	9.3	2.7	77.9	17.6	13.4	1.0	3.0	0.1	.87
Radio	61.5	99.0	80.6	80.3	44.9	82.2	96.9	67.9	53.2	96.6	92.5	87.6	36.5	91.0	36.1	28.2
Heaters	93.1	99.0	95.9	91.0	92.9	98.6	99.4	99.4	96.1	98.9	97.9	97.6	92.4	98.0	92.3	98.7
White Walls	53.4	98.0	80.3	73.2	52.0	83.5	88.0	84.7	75.8	98.6	85.9	83.6	44.6	72.0	40.7	40.1
Air Conditioning	1.4	34.0	3.7	1.6	2.2	10.6	33.3	6.2	3.6	35.0	12.5	7.5	1.8	5.0	4.8	.4
Tinted Glass	12.3	85.0	35.9	32.9	19.0	48.7	84.6	36.3	26.4	90.3	38.0	52.8	13.4	19.7	13.2	10.3
Windshield Washers	31.3	STD	41.0	61.4	31.9	92.7	100.0	48.4	40.9	100.0	80.1	71.6	NA	31.0	29.1	14.4
Back-up Lights	34.6	STD	83.5	43.4	42.4	100.0	100.0	80.4	85.9	100.0	65.2	78.3	NA	90.0	39.2	53.0
V-8 Engines	76.1	STD	STD	STD	76.9	STD	STD	STD	94.3	100.0	100.0	100.0	62.4	STD	15.2	45.8
6-Cylinder Engines	23.9	NA	NA	NA	23.1	NA	NA	NA	5.7	NA	NA	NA	37.6	NA	84.8	54.2
Air Suspension	0.3	0.2	0	0	NA	NA	NA	NA	NA	14.2	6.1	10.7	2.0	3.5	.04	NA

1957 MODEL YEAR

Percentage, Factory Installations Only

	Ford	Lincoln	Merc.	Plymouth	Chrys.	De Soto	Dodge	Cad.	Olds.	Buick	Chev.	Pontiac	AMC	Stud.-Packard
Automatic Trans.	71.4	STD	94.7	78.6	99.9	99.3	97.0	STD	98.9	98.0	66.0	96.0	60.0	58.7
Standard Trans.	23.2	NA	3.9	20.2	0.1	0.7	3.0	NA	1.1	2.0	31.6	4.0	22.0	14.9
Overdrive Trans.	5.4	NA	1.4	1.2	NA	NA	NA	NA	NA	NA	2.4	NA	18.0	26.4
Power Brakes	9.6	STD	48.8	12.2	83.7	69.0	26.0	STD	82.4	57.3	10.5	45.1	24.7	14.3
Power Steering	27.0	STD	50.9	17.7	97.1	81.5	50.0	STD	77.3	63.0	15.6	41.0	23.0	20.5
Power Seats	1.9	58.0	12.3	0.5	38.0	8.0	2.3	76.0	12.3	17.9	0.3	1.4	NA	2.0
Power Windows	1.8	86.0	7.3	0.6	35.3	8.0	2.1	98.0	2.7	16.8	0.5	2.3	.004	2.1
Radios	68.6	99.4	88.5	47.9	89.5	71.0	54.0	99.0	93.6	89.7	50.5	90.2	45.0	50.4
Heaters	90.5	99.8	91.8	94.5	98.0	98.0	96.0	98.0	98.3	98.0	93.1	97.5	91.0	92.9
White Walls	56.4	99.0	84.2	57.2	85.0	85.0	80.0	98.0	85.2	81.4	45.7	92.9	46.0	61.3
Air Conditioning	0.5	22.0	5.3	1.5	14.1	5.0	2.6	32.0	9.9	6.3	1.1	3.9	6.0	37.0
Tinted Glass	16.6	92.0	56.5	17.9	58.3	31.0	20.0	90.0	41.4	59.4	15.0	23.7	27.4	21.4
Windshield Washers	37.5	STD	65.2	31.9	85.4	53.0	42.0	STD	79.5	76.0	NA	24.5	24.5	27.0
Backup Lamps	41.2	STD	95.2	42.8	100.0	38.0	88.0	STD	68.3	82.5	NA	54.6	49.7	41.2
V-8	86.9	STD	STD	75.4	STD	STD	94.0	STD	STD	STD	63.5	STD	31.0	69.5
Dual Headlamps	NA	98.0	32.6	NA	70.0	39.7	NA	NA	NA	NA	NA	NA	9.6	NA

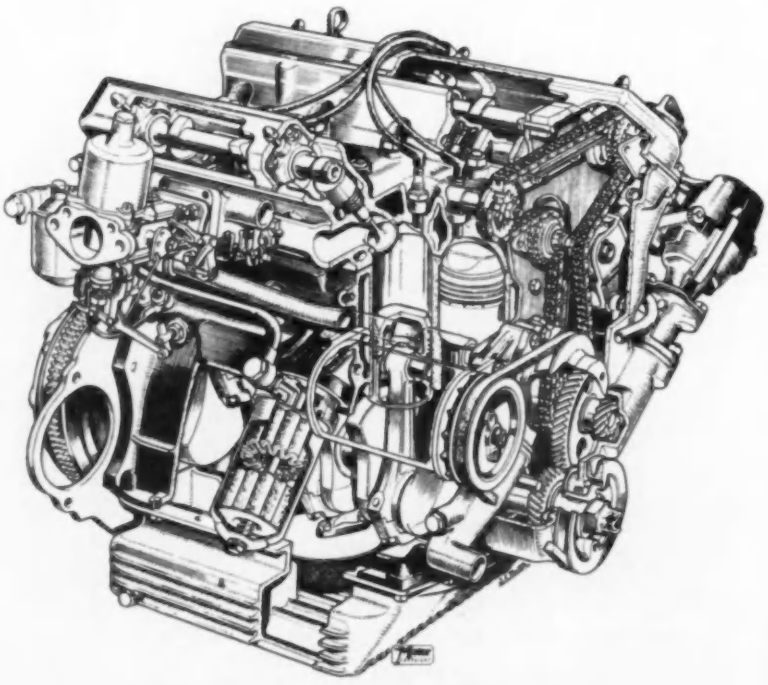
Twin Overhead Camshaft Engine for MGA Sports Car



Transverse section of the engine showing details of the valve gear, cylinder head design, etc.

Drawings by courtesy of *The Motor*, England

THE Nuffield Organization in Britain has introduced a twin overhead camshaft version of its basic 1.5-liter engine which is offered as an optional power unit for the MGA sports car. With 9.9 to 1 compression and the bore slightly increased to raise displacement to 1589 cc, the four-cylinder engine develops 108 hp at 6700 rpm. The aluminum alloy head incorporates hemispherical combustion chambers with large-diameter valves symmetrically inclined at an included angle of 80 deg. The standard cylinder block for the pushrod unit has been adapted by replacing the low-level camshaft with a plain shaft geared to the crankshaft to run at half speed. This carries the sprocket for the single Duplex roller timing chain, while also driving the distributor, oil pump and tachometer through three sets of gears. Other modifications include a stiffened crankshaft and a cast aluminum oil pan, ribbed both inside and out for extra cooling, with large oil capacity. Cars fitted with this engine are designated "MGA Twin Cam," and also feature disk brakes and center-lock wheels all around.



Cutaway drawing of the 1.5 liter OHC engine

• • •

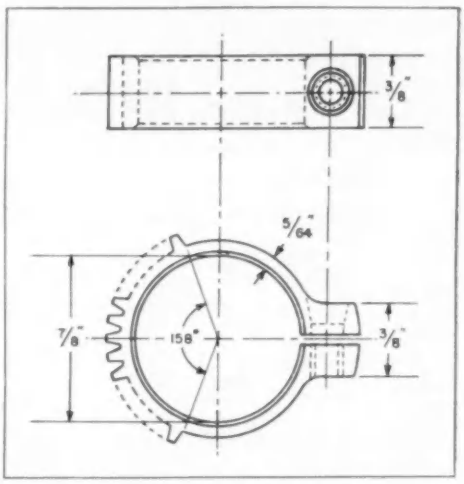
New Rent-A-Car System Is Launched in Chicago

A new car and truck leasing system was launched in Chicago with the announcement of the formation of Nationwide Rent-A-Car Or Truck, Inc.

Richard J. Fencl, former president of Greyhound Rent-A-Car, Inc., and president of Nationwide, said the new organization will concentrate during the first two years of operation on long-term leasing of all makes of automobiles and trucks in all major U. S. cities. He said the company has no plans for entering the daily car rental field during this period.

Extruded Steel Bars Reduce Machining Time

Hot-Extruded, Cold-Drawn Steel Bars Eliminate Most of the External Machining on Split Clamping Rings for Fuel Injection Pumps



Clamping ring with toothed segments used in fuel injection pumping elements

MACHINING time on split clamping rings with toothed segments used in fuel injection pumps, has been reduced an estimated 22 per cent by using hot-extruded, cold-drawn steel bars instead of standard round stock.

The change in material for a large-scale production part has resulted in a cost saving estimated at approximately 18 per cent of former costs, according to process engineers in the Springfield, Mass., plant of American Bosch Arma Corp. Two milling operations and one grinding operation on blank rings were eliminated.

This improvement in production methods was worked out with the help of engineers of Jones & Laughlin Steel Corp. Extruded steel bars 10 to 12 ft long, with a contour that was formerly milled out of ring blanks cut from round bars, are now made by J&L with dimensional tolerances close enough to eliminate all external machining of rings except cutting the teeth. The bars are of AISI type C1144 steel with a minimum diameter of approximately 1 1/32 in.

Blanks 3/8-in wide are cut from these extruded steel bars on a 1 5/8-in. Gridley automatic screw machine which performs the same six initial machining operations as were done on 1½-in. round steel bars.

Subsequent machine operations put 15 gear teeth in the 158-deg segment and provide means of clamping the ring on a sleeve in the fuel injection pump. A lockscrew hole is drilled through the 3/8-in. wide projection on the ring and tapped on one side. Then the ring is cut by a milled slot through the center of the projection perpendicular to the lockscrew hole.

A ring is required for each of one to eight pumping elements in various models of fuel injection pumps. The rings are components of the linkage that controls fuel flow to each engine cylinder. ■

Fellows gear shaper cuts 15 teeth in 158-deg segment of the ring

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Aug. 23	Weeks Ending Aug. 16	Year to Date 1958	Year to Date 1957
PASSENGER CAR PRODUCTION				
Rambler	.....	.....	110,834	62,968
Total—American Motors	.....	.....	110,834	62,968
Chrysler	.....	.....	31,547	88,806
De Soto	.....	.....	23,101	86,672
Dodge	.....	275	67,060	213,947
Imperial	.....	.....	8,330	29,686
Plymouth	1,980	7,654	255,826	489,707
Total—Chrysler Corp.	1,980	7,929	389,864	909,018
Edsel	225	353	8,503	18,024
Ford	17,894	21,989	643,724	1,045,553
Lincoln	356	175	16,880	26,967
Mercury	3,395	4,002	83,645	208,788
Total—Ford Motor Company	21,890	26,519	752,752	1,299,332
Buick	2,058	.....	135,199	286,120
Cadillac	.....	.....	89,510	109,225
Chevrolet	.....	25,229	885,547	1,036,002
Oldsmobile	.....	.....	213,141	276,058
Pontiac	1	23	135,704	217,334
Total—General Motors Corp.	2,059	25,254	1,450,076	1,956,733
Packard	.....	.....	1,723	4,818
Studebaker	.....	.....	21,601	39,774
Total—Studebaker-Packard Corp.	.....	.....	23,324	44,592
Checker Cab	.....	.....	2,120	2,718
Total—Passenger Cars	25,919	59,702	2,728,970	4,275,167
TRUCK AND BUS PRODUCTION				
Chevrolet	93	4,532	183,394	239,273
G. M. C.	918	1,006	39,785	44,968
Diamond T	108	83	3,402	3,530
Divco	36	60	1,764	2,043
Dodge and Fargo	.....	496	38,464	54,027
Ford	3,793	4,738	145,834	234,989
F. W. D.	25	17	801	759
International	1,185	1,462	80,511	80,052
Mack	292	263	9,629	11,425
Studebaker	100	100	6,637	9,080
White	286	283	10,726	12,991
Willys	1,896	.....	51,859	49,133
Other Trucks	40	40	1,935	2,873
Total—Trucks	8,772	13,120	553,743	744,041
Buses	62	45	2,181	2,874
Total—Motor Vehicles	34,753	72,867	3,284,894	5,022,082

1958 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	June	Six Months 1958	Six Months 1957
Vans			
Insulated and refrigerated	264	1,618	2,567
Steel	23	196	353
Aluminum	241	1,422	2,214
Semi-insulated	50	265	366
Steel	50	265	64
Aluminum	.....	.....	302
Furniture	168	905	1,006
Steel	168	905	914
Aluminum	.....	.....	92
All other closed-top	1,274	7,337	10,277
Steel	491	2,554	4,916
Aluminum	783	4,783	5,361
Open-top	149	817	1,657
Steel	94	432	869
Aluminum	55	385	788
Total—Vans	1,905	10,942	15,873
Tanks			
Non-and low pressure			
Petroleum			
Carbon and alloy steel	156	1,138	.....
Stainless steel	5	109	.....
Aluminum	109	631	.....
Total—Petroleum	270	1,878	2,753
Chemical, food, fluid solids	47	372	.....
All other, incl. aircraft refuelers	28	166	.....
High pressure (LPG, chemicals, etc.)	11	141	.....
Total—Tanks	356	2,557	3,723
Pole, pipe and logging			
Single axle	33	186	306
Tandem axle	46	221	428
Total	79	387	734
Platforms			
Racks, livestock and stake	122	773	1,153
Grain bodies, all types	80	417	871
Platforms (flats), all types	501	2,604	4,034
Total—Platforms	703	3,794	6,058
Low-bed heavy haulers	236	1,245	1,806
Dump trailers	309	1,221	1,255
All other trailers	191	963	1,843
Total—Complete Trailers	3,779	21,109	31,292
Trailer chassis[1]	269	1,578	1,882
Total—Trailers and Chassis	4,048	22,687	33,174

[1] Sold Separately.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	July 1958	June 1958	July 1957	Seven Months 1958	Seven Months 1957	Per Cent Change: July over June	July over July 1957	Seven Months 1958 over 1957
1	New England	24,571	24,303	30,547	155,867	193,898	+ 1.10	−19.58	−19.61
2	Middle Atlantic	83,782	88,011	110,442	545,475	700,931	− 4.81	−24.14	−22.18
3	South Atlantic	47,901	49,943	65,691	352,657	460,219	− 4.29	−27.23	−23.37
4	East North Central	91,150	95,400	127,159	646,737	899,043	− 4.45	−28.32	−28.06
5	East South Central	16,206	17,428	26,072	120,449	173,379	− 7.01	−37.84	−30.53
6	West North Central	39,961	39,805	45,340	272,149	311,836	+ 0.37	−11.89	−13.73
7	West South Central	36,634	34,820	52,318	252,994	335,639	+ 5.21	−29.96	−24.62
8	Mountain	15,550	14,412	18,231	101,766	118,996	+ 7.90	−14.71	−14.48
9	Pacific	44,641*	46,495	60,782*	320,551*	413,514*	n.c.	−26.56	−22.48
	Total—United States	400,296*	410,607	536,582*	2,768,645*	3,607,457*	n.c.	−25.40	−23.25

* Does not include returns for July for state of Oregon. n.c.—Not comparable.

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

Latest Albion Trucks

Have Low-Stressed Axle Shafts and Double Reduction Gearing

EPICYCLIC hub reduction and a high-ratio rear axle are features of a new range of 7-ton trucks introduced by Albion Motors Ltd., of Scotstoun, Scotland, a subsidiary of Leyland Motors Ltd. Departing from the worm drive of its earlier heavy vehicles, Albion now uses a spiral bevel axle on its latest "Chieftan" models.

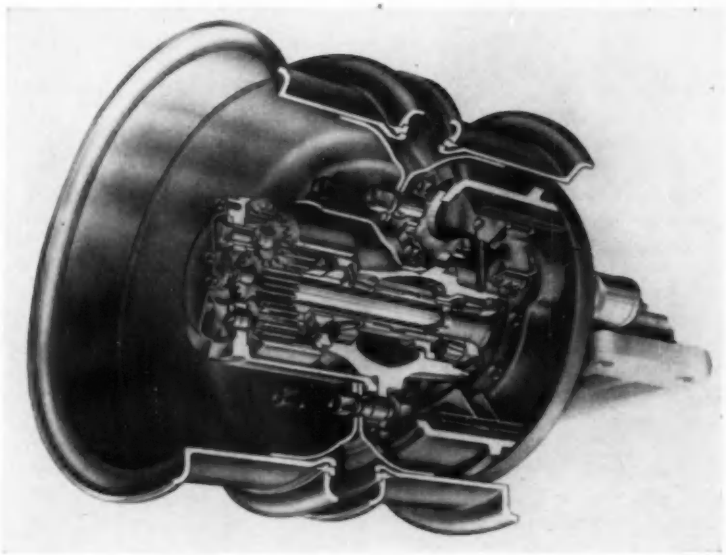
This has an unusually large pinion and small ring gear with a ratio of 1.5 to 1, giving light torque applied to the axle shafts. Compactness, lightness and high ground clearance are other advantages.

Double-reduction units in each rear wheel hub have epicyclic gearing that provides a further 4 to 1 ratio. They are lubricated with oil from the differential housing, needing no special greasing, and are small enough to permit the use of standard 20-in. wheels.

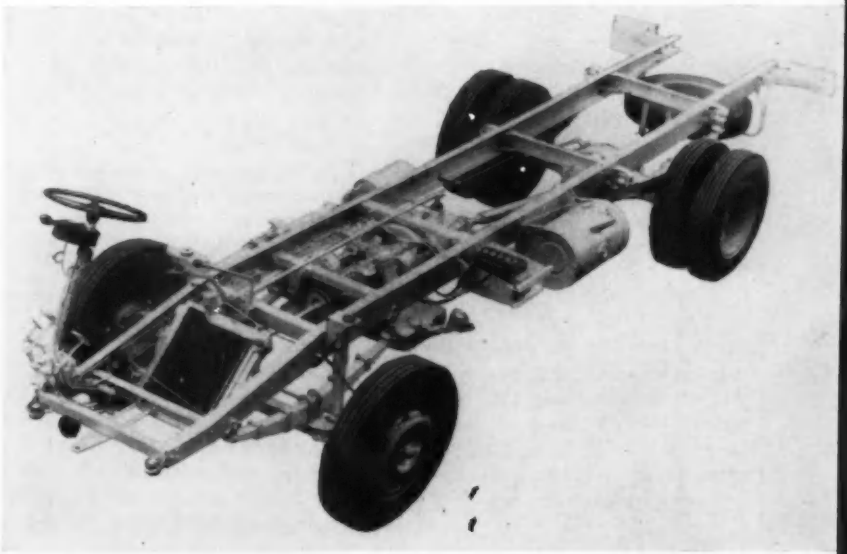
Engine is the basic 335-5-cu in. four-cyclinder Diesel derated to 90 hp at 2200 rpm for greater economy and longer life between overhauls. It drives through a six-speed constant-mesh gearbox with an overdrive top of 0.76 to 1. The engine can be withdrawn through the detachable grille for maintenance. These trucks are made in three wheelbases from 10¼ ft to 13½ ft, as well as an 8½ ft dump truck.

A second range of new Albions employ underfloor engine mounting, and are stated to be the only British vehicles of this construction in the 4/5-ton payload category. Advantages claimed for this design are improved weight distribution and suspension characteristics, tight turning circle, large body space for a comparatively short overall length, easy access to the power unit, reduced engine noise in the driving compartment, and the possibility of full-forward control with an unobstructed cab floor.

The 251-cu in. Diesel, developing 72 hp at 2200 rpm, is cooled by a radiator mounted under the cab at an angle to reduce overall height yet provide a large convection area. This is a two-way flow radiator, with water at high velocity forced twice across it.



Epicyclic reduction hubs of the Albion Chieftan are compact enough to permit the use of standard 20-in. wheels



Albion Claymore chassis with underfloor engine has frame members downswept in front to allow fitting a full-forward cab with low floor line

AIR BRIEFS

By R. RAYMOND KAY

The impact of the aircraft-missile industry on the economic life of the nation is terrific. Its roots extend into our entire economy. Few realize that the industry is one of the two largest in the country. In fact, it runs neck and neck with automotive. And it vies with steel and automotive as the key to the over-all business trend of the country.

The aircraft-missile industry leans heavily on more than 30,000 subcontractors and suppliers. Some 55 per cent of its dollar goes to them. Right now, the industry provides jobs for 750,000 persons. The Pentagon will shell out $11 billion for aircraft, missiles, and related products in fiscal 1959.

Jet Age Air Travel

This year you will see the start of Jet Age air travel. Planemakers will begin to pour out their multi-billion dollar backlog of orders for jets and propjet airliners. And the plants will deliver a billion dollars worth of civil and military products to foreign markets. Once known as a "war baby," the aviation industry has an impact on banking, transportation, construction, retail sales, and almost all other business. Education, too, feels the effect of demand from the industry for large numbers of trained persons.

Manned Satellites?

Missiles to the moon, to Mars, to Venus? Reconnaissance satellites? Manned satellites? Orbiting the moon in a manned vehicle? All of these things are possible within today's "state of the art." In fact, much of the basic hardware is in existence, an aircraft industry spokesman says.

New Weapons

For the day after tomorrow, weapon system needs will be even more severe than today's. We must work now toward unmanned reconnaissance satellites; toward space piloted vehicles with weapon deployment capabilities; and toward defense system complexes far better than anything we now foresee.

Lt. General C. S. Irvine, Deputy Chief of Staff, Materiel, USAF, writing in the General Electric Defense Quarterly, says that in the future, it's entirely possible that today's nuclear warheads will be totally obsolete. "Controlled elliptical mirrors, infra-red, and photon devices may be developed in conjunction with space vehicles. It is also possible that fantastic new electronic devices, employing a technical follow-on to radar, will enable our forces to neutralize or paralyze an aggressor force without loss of life or destruction of property," General Irvine believes.

Brief Air Briefs

Dyna-Soar, the manned orbital space glider, won't be flying for five years. . . . There'll be a speed-up in the development of the Army's Pershing ballistic missile. That's the one that will replace the Redstone . . .

Look for new rivalry between Army and Air Force missilemen. Pentagon planners must soon make up their minds which weapon they want as the main anti-aircraft missile: Army's Nike-Hercules or Air Force's Bomarc.

When the Army tries to launch its moon probes, the event will be shrouded in utmost secrecy. They'll wait until there's something to boast about. . . . The outlook for civil aviation is brightening despite the scattered economic showers on the horizon.

Conventional weapons are the heart of our deterrent force now and will be for the next several years. . . . Business flights dwarf domestic airline flying: 8 million hrs vs. 3.3 million hrs per yr.

The challenge to the Air Force and to industry management is clear, a top USAF general says. It is to achieve as much progress in the next five years as in the past fifty. . . . The Air Force lets about a million contracts a year. . . . Russia is reported to have built 70 of its twin-jet Tu-104's.

Jet-powered aircraft soon to go in service on the world's skyways will have a profound effect on international commerce and travel.

Over $900 million is earmarked for missile ground support during this fiscal year. In fiscal 1960 the amount will probably top $1 billion.

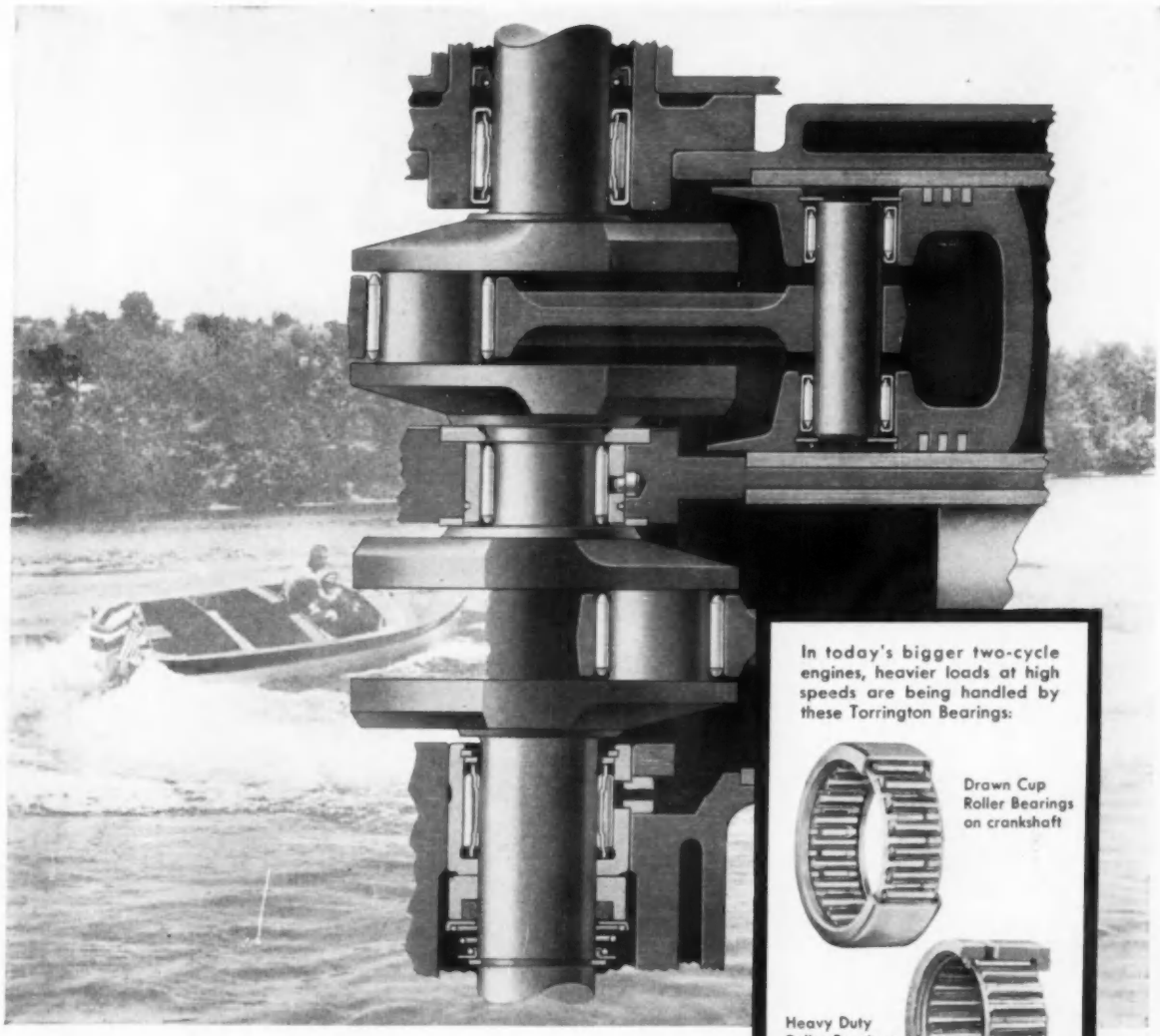
Opportunities for Small Companies

Can a small company get its foot into the missile-business door? You've probably heard a lot of talk that a small firm hasn't a chance.

Don't you believe it, says Major General Ben I. Funk. And he ought to know. He's the ballistic missiles buying boss for the Air Materiel command.

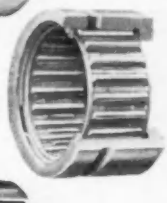
"If you can produce the hardware we so urgently need, we will help you in every possible way to get on the team. It is up to you to make your capabilities known, and sell them to the major prime contractors and to the Air Force. I urge you to do this now, to the advantage of your company," Gen. Funk says.

Of course, the majority of small business firms can't produce airframes, engines, and major components which make up the ballistic missile weapon system. However, the subcontract market is wide open. The sky is the limit, the general insists.

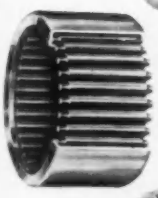


In today's bigger two-cycle engines, heavier loads at high speeds are being handled by these Torrington Bearings:

Drawn Cup Roller Bearings on crankshaft



Heavy Duty Roller Bearings



Full Complement Needle Bearings on wrist pins

Needle Rollers with crankpin ends

Fractured outer race for center main on crankshaft

What's new in two-cycle engines?

Today's improved performance and increased power made possible by recent developments in Torrington Bearings!

In this schematic drawing of a typical two-cycle engine, a Torrington Drawn Cup Roller Bearing and a special Torrington Heavy Duty Roller Bearing provide several improvements in the crankshaft mounting. Shaft-riding retainers guide the rollers at the pitch line and provide ample lubricant circulation. Positive roller guidance insures correct bearing performance despite shaft deflection. Split center bearing on crankshaft features a fractured outer race for positive location of the race halves.

Full complement Torrington Needle Bearings and Needle Roller assemblies with crankpin ends complete the compact, high-capacity design to insure long, trouble-free service life. To secure the advantages of modern Needle Bearing design in your application, consult Torrington's engineering department. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • TAPERED ROLLER • SPHERICAL ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

New easier way

. . . to use stainless steel lock wire!

Note how the lock wire, uncoiling from the inside, is dispensed as needed from a hole in the top of this compact 1-pound package. No wild uncoiling! Moreover, the wire is better protected, handles easier and faster, with less waste, and with greater safety!

Here is a new National-Standard packaging development that is a natural for most safety lock wire uses in equipment manufacture, assembly and servicing.

For production operation requiring larger capacities, National-Standard offers lock wire on practical 5 and 10-pound disposable spools that may be spindle-mounted.

Check with National-Standard on the spooling of your choice and on stainless steel lock wire in any diameter from 0.020 to 0.067 and to government specifications: QQ-W-423, AN-W-24, MIL-W-6713 or AMS-5685-C.

NATIONAL NS **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *fine wire, stainless, music spring and plated wires*
WORCESTER WIRE WORKS, Worcester, Mass.; *music spring, stainless and plated wires, high and low carbon specialties* • REYNOLDS WIRE, Dixon, Ill.; *industrial wire cloth*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.; *flat, high carbon spring steels*

The NEW

EATON ROLL-PUMP

for Power Steering Systems

Higher Efficiency • Greater Dependability
Simplified Design • Proven Performance
Quieter Operation

EATON

Eaton Designs and Produces Pumps for a Wide Range of Applications.
Consult with Our Engineers on Your Pump Needs.

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Living room luxury on the road ... economically ... with

URETHANE FOAMS!

Based on NACCONATES®

Progress in urethane chemistry has now created the ultimate in seating comfort. Proof: leading names in luxurious home furnishings feature urethane foams in their fall '58 lines!

Especially suited to automotive seating, urethanes have air-cushioned comfort without "fight-back" and "side-sway." Outer coverings hug cushions—no wrinkles, no displaced welts. And urethanes have remarkable tensile and tear strength, low permanent set and resist solvents and low temperature stiffening.

The many ways urethanes can be fabricated ... molded, foamed in place, bonded to structural frames or outer coverings, cut, sewn, tacked or hog-ringed ... suggest new cost-saving production methods that are well worth your investigation.

As makers of NACCONATE® Diisocyanates, essential urethane components, we will gladly work on application development with automotive engineers, designers and suppliers. For information, write National Aniline.

Allied Chemical

NATIONAL ANILINE DIVISION

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Limit Switches 1

Bulletin MAR-58, 12 pages, describes a series of heavy-duty limit switches featuring double pole—double throw, two normally open—two normally closed contact design. The switches are made to insure a quick-make and quick-break of contacts, together with locking in both the open and closed position. *The National Acme Co.*

Eccentric Geared Presses 2

Bulletin 66A covers the Niagara Series SE straight side, single action, eccentric geared presses for large, heavy tonnage drawing, punching and blanking work. *Niagara Machine & Tool Works.*

Tracer Lathe 3

The Sundstrand Model 14T Multi-Cycle Hydraulic Tracer Lathe which permits irregular shapes to be turned with speed and accuracy is described in a new bulletin issued by the *Sundstrand Machine Tool Co.*

Alloy Steels 4

The Joseph T. Ryerson booklet entitled "The Eight Steps to Risk-Proof Alloy Steels" explains how an 8-point plan gives added protection to buyers of alloy steels. *Joseph T. Ryerson & Son, Inc.*

Electrical Switches 5

Subminiature push buttons, subminiature limit switches, pulsing limit switches and other specialized devices are among the items described in a new catalog of switch products. *Licon Switch & Control Div., Illinois Tool Works.*

Vacuum Melting 6

New data and specification sheets covering vacuum melting techniques and high-temperature vacuum-melted alloys are available from *General Electric Company's Metallurgical Products Department.*

Servo Valves 7

Catalog 210 contains a series of curves and schematics which highlight the design and performance characteristics of a line of low flow servo valves for military, industrial and research application. *Moog Valve Co., Inc.*

Silicone Fluids 8

An engineering guide to silicone fluids for mechanical applications presents a compilation of information essential to selecting the most suitable fluids when designing for reliable, uniform performance. *Dow Corning Corp.*

(Please turn page)

VOID After Nov. 15, 1958 **9/15/58**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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Industrial Motors 9

Bulletin F-1957 describes a new line of vertical syncrogear motors designed to provide rugged, dependable, internally geared power for industrial agitator applications. *U. S. Electrical Motors Inc.*

Gear Drives 10

Solutions to a variety of industrial transmission problems with standardized 90-degree power takeoffs are shown in Catalog IA-58. *Airborne Accessories Corp.*

Resistance Thermometers 11

Complete information about Thermohm detectors (resistance thermometers) for temperatures up to 1000F is contained in 34 page Catalog EN-S4. *Leeds & Northrup Co.*

Drum Separator 12

The Indor V Drum Separator for continuous and automatic removal of tramp iron in process industries is described in an eight page bulletin. *Stearns Magnetic Products.*

Cutting Unit 13

Four page folder DH-106 presents information on the Model 1-A Sever-All dry abrasive cutting machine which will cut solids up to two inches, square, pipe and tubing up to 3½ in. OD, angle iron up to 3 by 3 in. and channels up to four inches. *American Chain & Cable Co., Inc.*

USE THIS POSTCARD

Correction

In the August 1st issue of AUTOMOTIVE INDUSTRIES it was incorrectly stated (page 70) that the four-page bulletin offered by Hartman Metal Fabricators, Inc. described the Flexi-rack pallet truck. This should have read Flexirack pallet rack.

Barrel Finishing 14

Bulletin 200 describes design features of Model 30 Series Techline barrel finishing machines. Specifications of 20 standard models are included. *Techline Div. of Wheelabrator Corp.*

DC Motors 15

Bulletin F 8792 covers a line of dc motors. Among the features listed are: self-aligning bearings; battery operation; patented integral governor without slip rings or brushes. Design, specifications of two typical motors, and dimensional diagrams are included. *Barber-Colman Co.*

Diamond Wheels 16

A 28 page catalog describing metallic and resinoid bonded Diacraft diamond grinding wheels is available from Diacraft, Inc. The wheels are made in all the customary shapes and sizes for carbide grinding as well as custom-made wheels for special applications.

Milling Cutters 17

Bulletin 582 contains information on the construction of cutters using square and triangular carbide inserts. It also lists sizes, dimensions, etc., of standard shell end, face and half side mills. *McCrosky Tool Corp.*

Pusher Furnaces 18

Type BA pusher furnaces with ceramic heating elements for temperatures up to 2400 F are described in Bulletin 463. They are used for bright treatment of stainless steels, nicro-brazing, sintering of powder metal parts, copper brazing and ceramic metallizing. *C. I. Hayes, Inc.*

Optical Gaging

Catalog 10, 114 pages, offers information on optical gaging. The book is indexed, with sections devoted to chart layout methods, standard chart gages, standard accessories, projector tracers, custom chart gages and fixtures, and contour transcribers. Address request on company letterhead to *Optical Gaging Products, Inc., Rochester, N. Y.*

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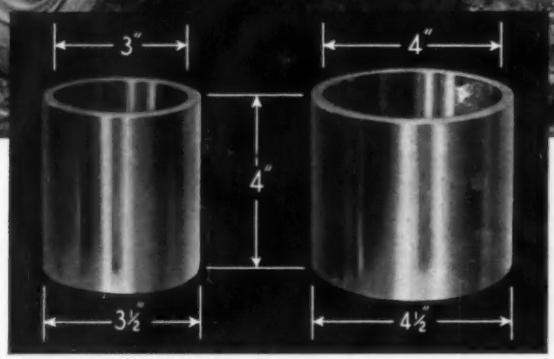

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prove a match for top payloads on ATHEY Rear Dump Trailers

Oilite* Bronze Bearings have proven more than a match for the 22 and 34-ton payloads on Athey Rear Dump Trailers.

Oil-cushioned against shocks and impacts, these Oilite heavy-duty bearings have demonstrated that they will withstand years of punishment and still give satisfactory service. They require only infrequent lubrication and help Athey substantially increase the dependability of its hauling units. Yet, Oilite Bearings *cost less* than many other type bearings!

No wonder more and more designers are specifying popular Oilite self-lubricating Bearings for motor vehicles, appliances, engines, power tools, machinery and countless other products.

Contact your local Oilite Engineer today. He'll gladly provide complete design information to help you make your bearing and bushing applications low-cost, dependable and maintenance-free. Look for him in your telephone directory under "Bearings—OILITE" or write direct to Dept. K-9.

TYPICAL PROPERTIES OF SELF-LUBRICATING BRONZE OILITE BEARINGS †

Porosity, %	18-23
Ultimate Tensile Strength, (psi)	18,000
Compressive Strength (psi)	20,000
Elongation, % min. in 1"	10
Brinell Hardness	40

† Other materials and physical properties available.

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SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

With Estimated Order Backlog of 2.7 Months, Machine Tool Industry Is in Excellent Position to Provide Early Deliveries on New Equipment

July Machine Tool Sales Better Than Anticipated

Machine tool sales during the month of July substantially maintained recent performance, despite the adverse effects of vacation shut-downs. As a matter of fact, the volume, while not impressive, was better than many had anticipated.

Net sales of metal cutting-type machine tools amounted to $21.2 million, and forming-type machine tool net sales were $5.7 million, for a combined total of $26.9 million.

Shipments in July (amounting to $29.65 million total) had a value more nearly in line with new order receipts than in any previous 1958 month. In the prior months the value of shipments considerably exceeded that of new order receipts. This reflects the absorption of last year's heavier order accumulations in the shipments during the first six months of 1958—and a "catching up" with current business. The industry, as a whole, is obviously in an excellent position to provide attractive faster-than-usual deliveries on new equipment.

Estimated order backlog of metal cutting-type machine tools was 2.8 months, and of forming-type machine tools was 2.4 months, or 2.7 months combined, at the conclusion of July operations.

The accompanying table presents the monthly figures on sales and shipments for this year.

New Machining Process

Development of a new machining process called Electro-Chemical Machining (ECM) has been announced by the Research Div. of Elox Corp. Its sponsors report that representatives of the automotive industries who have seen the equipment in operation consider its advantages in metal removal rates on large-scale die work to be particularly attractive.

Briefly, this is how the new process works: Using an electrode similar to that used in electrical discharge machining, with both electrode and workpiece submerged in a saline solution, metal is removed by an electro-chemical action controlled by a sensitive servo feed system that automatically advances the electrode into the workpiece as the machining progresses.

The currents that can be utilized are not restricted. Metal removal rates are listed by Elox in ranges of 500 to 50,000 amp. Typical metal removal rate, using a 5000-amp power supply rating and a minimum electrode area of 100 sq in., is 30 cu in. per hour. Using a 50,000-amp power supply rating and a minimum electrode area of 1000 sq in., metal removal rate is 300 cu in. per hour. Gap between the electrode and workpiece that controls the accuracy of the finished product has a low limit of 0.015-in. at the present time.

In addition to the high metal removal rates, the process has other advantages. Cost per cubic inch of metal removed is low because the electrode can be used many times without appreciable wear. The electrode may be made of any conductive material, such as lead, tin, zinc or solder, simplifying electrode preparation.

Tools-for-Schools

Government machine tool experts expect a big portion of the surplus this year will go to schools under the tools-for-schools program. They do not believe the Government's surplus tool disposals in the current fiscal year will materially affect the commercial market. The surplus will largely be absorbed in the school program and the National Industrial Equipment Reserve (NIER).

(*Turn to page* 100, *please*)

METAL CUTTING and FORMING TYPE MACHINE TOOLS

New Orders, and Shipments—By Months, 1958

(Millions of Dollars)

	Net New Orders			Shipments		
1958	Cutting	Forming	Total	Cutting	Forming	Total
Jan.	$19.30	$7.55	$26.85	$47.75	$10.05	$57.80
Feb.	22.80	5.50	28.30	38.50	9.55	48.05
Mar.	29.45	6.70	36.15	45.85	8.30	54.15
Apr.	22.90	5.40	28.30	40.20	10.70	50.90
May	21.90	6.15	28.05	37.60	12.50	50.10
June	23.05	9.05	32.10	35.45	10.05	45.50
July	21.20*	5.70*	26.90*	23.25*	6.40*	29.65*
7 mos.	160.60*	46.05*	206.65*	268.60*	67.55*	336.15*

* Preliminary.

Source: National Machine Tool Builders' Assn.

1957 INTERNAL COMBUSTION ENGINE SHIPMENTS

(EXCEPT AUTOMOTIVE AND AIRCRAFT)

As reported by the Industry Division, Bureau of the Census

These data relate to engines designed primarily for use in generating power; oil and gas-field pumping; locomotives; agriculture machinery; tractors; power lawn mowers; inboard and outboard motor boats; air compressors; and similar applications.

Quantity and Value of Shipments by Type of Engine, by Years

Type of Engine	Total Engines Produced	Shipments: No. of Engines	Shipments: Value at Plant	Used in Product of Same Co.
	1957			
Gasoline	4,923,718	4,136,318	$208,639,000	787,400
Diesel	126,961	58,133	241,310,000	68,828
Outboard	549,976	549,976	138,823,000	.....
Gas	20,882	7,407	55,561,000	13,475
Total—1957	5,621,537	4,751,834	$644,333,000	869,703
	1956			
Gasoline	5,883,349	5,050,341	$233,735,000	833,008
Diesel	140,814	56,462	214,830,000	84,352
Outboard	641,527	641,527	150,388,000	.....
Gas	20,472	9,289	47,196,000	11,183
Total—1956	6,686,162	5,757,619	$646,149,000	928,543
	1955			
Gasoline	4,932,259	4,017,848	$216,130,000	914,411
Diesel	139,231	60,778	191,612,000	78,453
Outboard	514,728	514,728	101,553,000	.....
Gas	18,038	7,900	34,179,000	10,138
Total—1955	5,604,256	4,601,254	$543,474,000	1,003,002
	1954			
Gasoline	3,669,505	2,993,575	$179,323,000	675,930
Diesel	104,686	48,639	172,271,000	56,047
Outboard	479,350	479,350	76,039,000	.....
Gas	10,691	6,190	25,993,000	4,501
Total—1954	4,264,232	3,527,754	$453,626,000	736,478

1957 Gasoline Engine Shipments by Hp and Displacement

Size Group	Total Engines Produced	Shipments: No. of Engines	Shipments: Value at Plant	Used in Product of Same Co.
HORSEPOWER RATINGS				
Under 3	3,729,789	3,374,974	$ 79,366,000	354,815
3.0-3.9	398,638	335,042	11,309,000	63,586
4.0-5.9	202,210	85,529	5,672,000	116,681
6.0-6.9	69,322	41,327	3,196,000	27,995
7.0-10.9	85,791	75,207	7,661,000	10,584
11-15	63,098	32,765	6,404,000	23,512
16-20		6,801	2,007,000	
21-30	63,547	33,592	11,092,000	29,955
31-45	100,596	37,223	9,993,000	63,373
46-60	112,217	35,834	10,371,000	76,383
61-70	29,212	11,097	5,856,000	5,212
71-80		12,903	6,515,000	
81-90	4,957	4,957	2,312,000	.....
91-100	47,581	18,576	6,166,000	11,138
101-150		17,867	14,107,000	
151-200		10,095	16,400,000	
201-300	16,760	2,292	6,300,000	4,156
301 and over		217	1,912,000	
Total—1957	4,923,718	4,136,318	$208,639,000	787,400
PISTON DISPLACEMENT				
Under 11	4,250,315	3,705,315	$ 89,924,000	545,010
11-30	224,487	189,337	13,850,000	35,150
31-40	7,686	5,966	1,040,000	1,720
41-50	83,968	13,545	3,525,000	14,501
51-75		35,942	6,979,000	
76-150	149,545	70,903	19,855,000	78,642
151-225	97,008	37,263	13,139,000	59,745
226-250	58,220	38,944	15,972,000	19,276
251-300	30,141	13,236	7,368,000	16,905
301-350	38,143	11,561	8,490,000	16,153
351-500		10,429	17,561,000	
501-600		1,498	2,469,000	
601-800		1,046	2,687,000	
801-900	4,185	475	1,287,000	298
901-2000		617	2,404,000	
2,001 and over		251	2,089,000	
Total—1957	4,923,718	4,136,318	$208,639,000	787,400

1957 Diesel Engine Shipments by Hp and Displacement

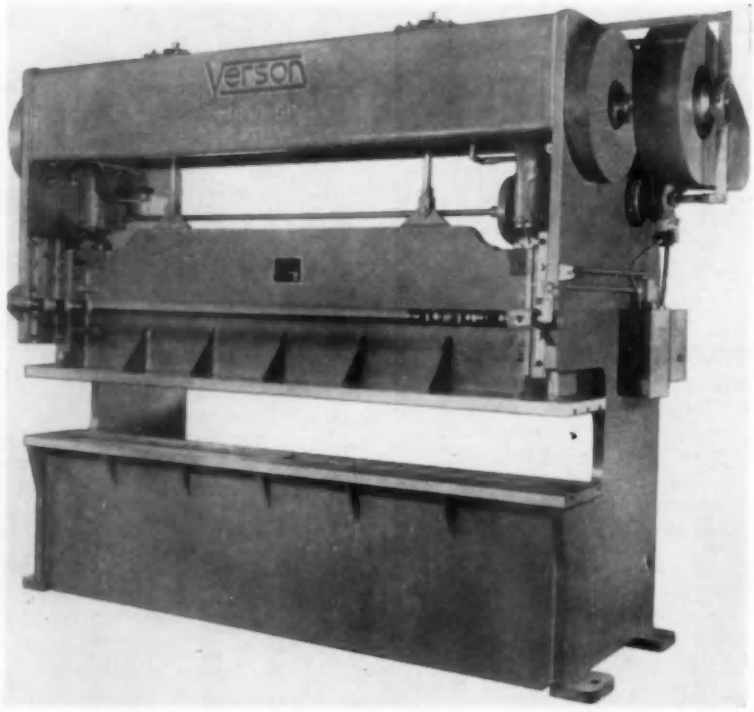
Size Group	Total Engines Produced	Shipments: No. of Engines	Shipments: Value at Plant	Used in Product of Same Co.
HORSEPOWER RATINGS				
Under 16	2,075	772	$ 1,417,000	1,303
16-40	6,116	3,652	2,754,000	1,335
41-50		1,129	1,014,000	
51-70	38,979	13,553	14,210,000	25,426
71-100	24,334	11,015	16,059,000	13,319
101-150	22,923	10,192	27,052,000	12,731
151-200	17,403	8,886	41,775,000	8,517
201-300	7,560	4,807	30,921,000	2,753
301-400		1,833	12,931,000	
401-500		845	18,713,000	
501-600		659	8,493,000	
601-700		106	5,538,000	
701-800	7,571	179	3,436,000	3,444
801-900		80	2,745,000	
901-1,000		84	4,383,000	
1,001-1,500		91	13,240,000	
1,501 and over		250	36,629,000	
Total—1957	126,961	58,133	$241,310,000	68,828
PISTON DISPLACEMENT				
Under 101	2,211	938	$ 1,677,000	1,273
101-150		5,071	5,711,000	
151-200	19,947	6,771	4,803,000	2,080
201-250		6,025	8,480,000	
251-300	25,256	12,428	19,672,000	12,828
301-400	24,726	3,348	5,652,000	21,378
401-600	27,246	10,482	38,054,000	16,764
601-800		5,649	22,832,000	
801-1,000	24,970	2,692	14,163,000	14,109
1,001-1,500		2,520	18,376,000	
1,501-2,000	1,387	801	12,056,000	111
2,001-3,000		675	14,360,000	
3,001-5,000		373	13,548,000	
5,001-10,000	1,137	285	21,808,000	285
10,001-25,000		194	21,809,000	
25,001 and over	81	81	18,309,000	.....
Total—1957	126,961	58,133	$241,310,000	68,828

1957 Outboard Engine Shipments by Hp Ratings and Displacement

Size Group	No. of Engines	Value at Plant	Avg. Value per Engine
HORSEPOWER RATINGS			
Under 5.0	52,634	$ 4,613,000	$ 87.64
5.0-9.9	137,619	20,324,000	147.68
10.0-14.9	74,030	15,823,000	209.66
15.0-34.9	111,236	29,621,000	266.29
35.0 and over	174,457	68,742,000	394.03
Total—1957	549,976	$138,823,000	$252.42
PISTON DISPLACEMENT			
Under 9.9	122,616	$ 14,285,000	$116.50
10.0-14.9	72,501	11,569,000	159.57
15.0-19.9	113,049	24,962,000	220.81
20.0-29.9	45,228	12,630,000	279.25
30.0 and over	196,582	75,377,000	383.44
Total—1957	549,976	$138,823,000	$252.42

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 73



Verson gang punching machine features light tonnage, large bed and ram area

Punching Unit With Light Tonnage, Large Bed, Ram Area

THIS gang punching machine features light tonnage and large bed and ram area. It provides a capacity of 60 tons and 126 in. between housings. The ram is of single plate construction with two slug chute openings in the rear. The machine has press type square gibbing arrangement, adjustable in both directions.

Design features include electric push-button clutch control, automatic lubrication and air counter balance of the ram. The stroke is 4 in., with 4 in., of ram adjustment which is power driven. Shut height, bed to ram, is 14 in., and the area of bed and ram, front to back and left to right, 20 in. by 132 in. Operating speed is 45 spm. *Verson Allsteel Press Co.*

Circle 30 on postcard for more data

Indexing Unit

PRECISION positioning between automatic production stations can be accomplished by use of a cam-operated indexing unit made by The Standard Tool & Mfg. Co.

It will operate with the index shaft vertical or horizontal. Each revolution of the cam shaft rotates the dial plate or index shaft through one index. A major portion of the rotation is used for dwell or work time, the balance for positioning to the next index. Each index provides accurate positioning for operations of assembly or for manufacturing operations such as machining, milling, drilling, punching, soldering, crimping, etc.

Circle 31 on postcard for more data

Melting Furnace

SURFACE Combustion Corp. has developed a dry hearth type aluminum melting furnace. Sizes of parts range from a few ounces to 90 lb. The molten aluminum flows down the hearth to a holding bath, where the metal is maintained continuously within 15 degrees. Melting can be at rates up to 600 lb per hour and the holding bath capacity is 1000 lb.

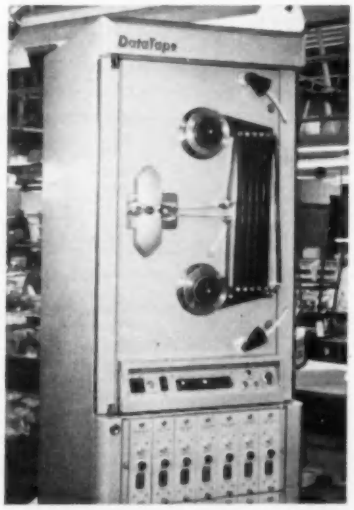
Circle 32 on postcard for more data

Tape Loop Adapter

DETAILED repetitive spectrum analyses of information recorded on magnetic tape are possible with this tape loop adapter.

Designed to be attached to the front plate of a magnetic tape recorder/reproducer, the continuous loop adapter permits study of transients in rocket engine tests, wave analyses by means of time compression, and similar operations.

The upper and lower arms of the adapter are adjustable to accommodate loop lengths from 2 to 26 ft. *Consolidated Electrodynamics Corp.*



Consolidated tape loop adapter

Circle 33 on postcard for more data

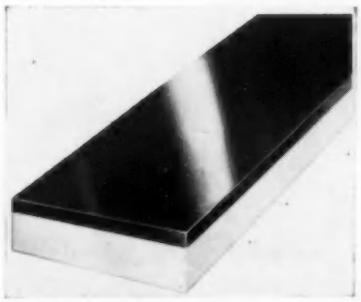
Fork Truck Attachment

THE Sky-Hi-Lift is a fork truck attachment with a collapsed height of 68 in. that can lift to 144 in. It has been especially designed for Automatic trucks with 2000 and 3000 lb capacities. One electric truck equipped with the lift becomes a dual purpose machine that can be used for high stacking and unstacking as well as for the loading and unloading of merchandise in over-the-road trailers. *Automatic Transportation Co.*

Circle 34 on postcard for more data

Clad Wear Plates

O-KNI-CO clad aluminum bronze wear plates are a combination of ¼ in. thick aluminum bronze clad to a machinable steel backing. They are available in 14 standard cross sections from ½ to 1¼ in. thickness, 1½ to 8 in. width, up to 72 in. in length. They have use in applications



Ohio aluminum bronze wear plate

such as slides in cam and trim dies, or wherever there is a sliding action between flat metal parts. *The Ohio Knife Co.*

Circle 35 on postcard for more data

Centering Reel

A LINE of automatic centering 3-arm reels for heavy coils of copper, bronze, brass and tin plate stock is especially designed for controlled uncoiling action.

They will accommodate coils up to 4000 lb, of 45 in. maximum OD and 18 in. maximum width. The minimum ID, 8½ in. to 10½ in., is especially adapted to the normally smaller inside diameters of copper, bronze, brass and tin plate stock. *F. J. Littel Machine Co.*

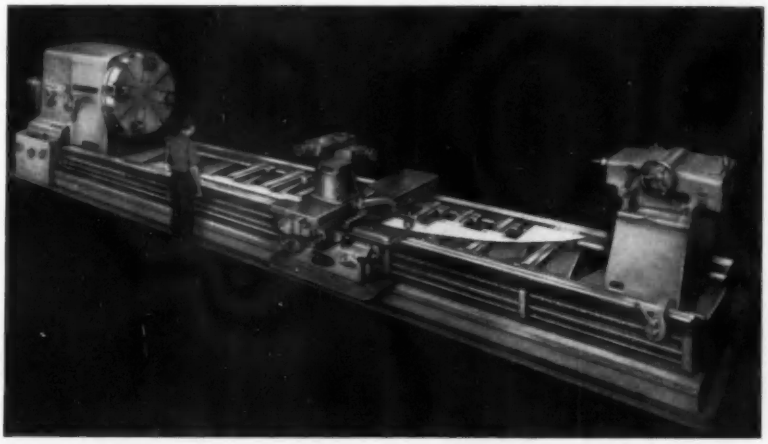
Circle 36 on postcard for more data

Milling Machine For Jet Engine Compressor Housings

Moline M43 milling machine for jet engine compressor housings

SIX annular grooves and the tops of six ribs around the outside surface of jet engine compressor housings are milled by this specially designed, six-spindle milling machine. The spindle rpm can be varied through a range of 6 to 1 and the horizontal feed rate of spindle slide is adjustable and is provided with positive stops to control depth of cut. Rotational feed rate of the table is also adjustable. Parts from 24 to 52 in. can be handled. *Moline Tool Co.*

Circle 37 on postcard for more data



Monarch "Missile Master" lathe for precision contour turning, boring, facing

Lathe For Precision Contour Turning, Facing, Boring

THIS lathe is designed for precision contour turning, facing, boring of missile nose cones, nozzles, motor cases, air frame sections, hemispherical and elliptical domes and other thin walled and fabricated parts.

Clearance diameter of the machine is 85 in., with a 67 in. cross slide swing. Bed lengths are available up to 300 in. between centers. *The Monarch Machine Tool Co.*

Circle 38 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Orienting Parts Feeder

MODEL 2700 Feedall provides automatic feed for high speed grinders and special press operations. It orients and feeds both rolling and sliding parts in continuous production and is completely self-contained.

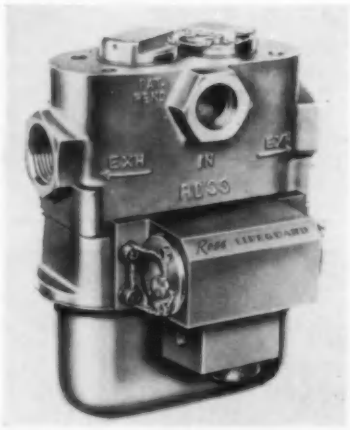
In addition to its basic application on double-disk grinders, the unit has many uses on centerless grinders and special press operations. *Feedall, Inc.*

Circle 39 on postcard for more data

Safety Valves

THE "C" version of the Ross Lifeguard valve has been designed to provide safety for operators of pneumatic clutch or clutch-brake controlled power presses. It senses any potential malfunction within itself and locks out to prevent unsafe press operation.

The valve consists of two three-way valve units connected pneumatically in parallel, each having its own pilot



Ross "C" version Lifeguard valve

valve operator and solenoid actuator. The attached "lock-out" unit supplies inlet air to the pilot valve operators. *Ross Operating Valve Co.*

Circle 40 on postcard for more data

Wire Cutter-Stripper

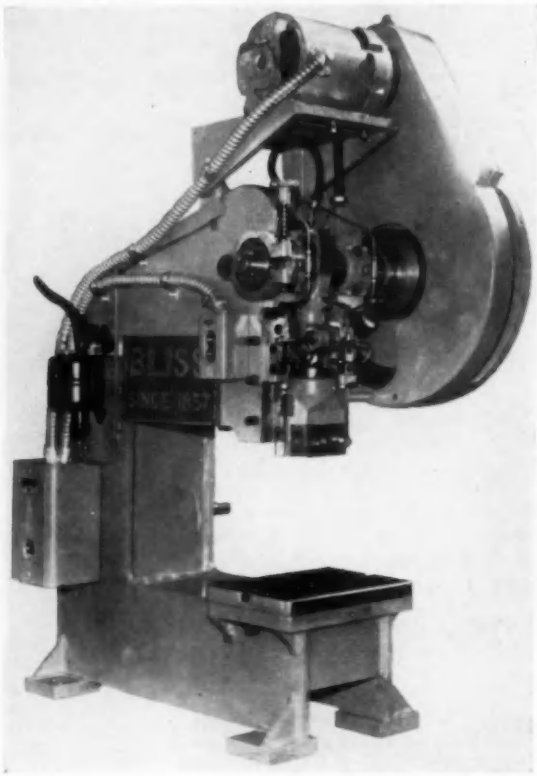
DESIGNED for high production operations, the Acme wire cutter and stripper produces over 9000 pieces per hour for 1 to 40 in. wire lengths. The machine handles a wide variety of single conductor, insulated wire, as well as solid wire and plastic or fabric tubing. *Jennings Machine Corp.*

Circle 41 on postcard for more data

Seven Ton Deep Throat Bench Press

Designed for high speed punching, cutting and forming operations on large wide sheets, this seven ton deep throat bench press weighs 600 lb and requires a bench space of 27 by 13½ in. and floor space with stand of 28 by 23 in. Designated the 018-DT, the press has a 1¼ in. standard stroke and is available with a maximum stroke of 2½ in. Throat depth measures 14 in. Features of the unit include a fully stress-relieved frame for greater stability and rigidity; the Bliss rolling key clutch; extra long gibs which support the slide at all positions and a heavy duty crankshaft precision forged of SAE 1045 steel. (E. W. Bliss Co.)

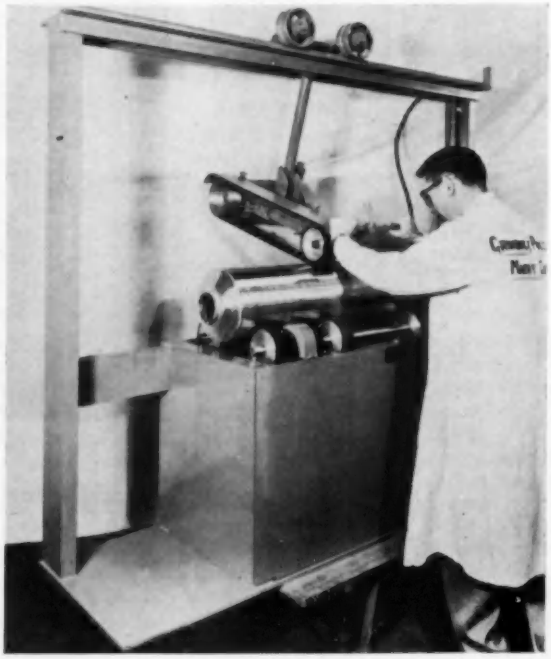
Circle 42 on postcard for more data



Abrasive Belt Grinder Unit Adapted To OD Grinder

Pictured is the G & P 6-72 abrasive belt grinder unit being used with an OD grinder. The belt unit is suspended above power rollers and a variable speed motor regulates the rotation of the cylinder while the operator moves the grinder across the part. Contact wheel grinding provides the aggressive cut needed for removing excess weld, and the slack of the belt produces an excellent finish quickly and economically. The belt unit is frequently used as a component for making machines, either as a primary part or as an auxiliary part of the machine. (Grinding & Polishing Machinery Corp.)

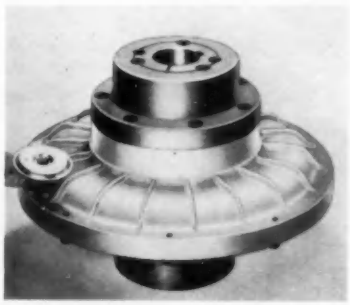
Circle 43 on postcard for more data



Dry Fluid Couplings

AN expanded line of Flexidyne dry fluid drives and couplings ranging in capacity from ¼ to 1000 hp is available from Dodge Mfg. Corp.

As a controlled acceleration device, Flxidyne employs a new principle for transmitting torque from motors or engines to driven machines. The "fluid" in the drives and couplings is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing, which is keyed to the motor shaft. When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor, which transmits power to the load. After an initial period of slippage, housing and rotor become locked together and achieve full load speed, operating without slip and with 100 per cent efficiency.



Dodge Flexidyne dry fluid couplings

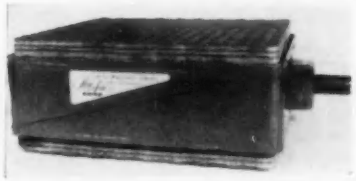
Circle 44 on postcard for more data

New Machine Mount

WEDGMOUNT machinery leveling mounts are available for use under machines weighing up to 50,000 lb. They operate on a sliding wedge principle to raise or lower the machines. Dimensions are 8 by 8 in.

Lateral movement of machines during operation is prevented by use "Air-Loc" material of vinyl, sisal and cork on the top and bottom of the mount. *Clark-Cutler-McDermott Co.*

Circle 45 on postcard for more data



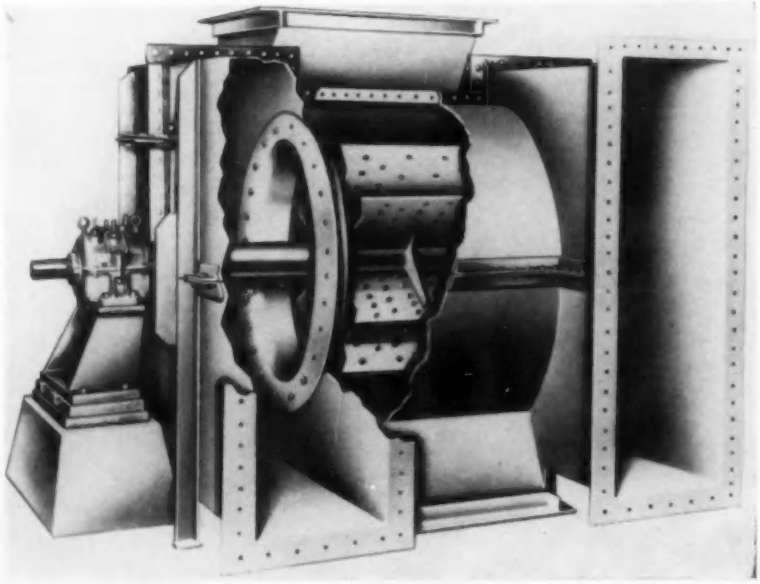
Clark Wedgmount machinery leveler

Precision Welder automatic welding and forming machine produces wire bolsters

High-Speed Welding And Forming Of Wire Bolsters

WIRE bolsters are produced automatically at the rate of 5000 feet per hour on this automatic welding and forming machine. All elements of the machine are driven and timed from a crankshaft coupled to a 5 hp motor and flywheel by a heavy duty air clutch and brake. *Precision Welder and Flexopress Corp.*

Circle 46 on postcard for more data



Westinghouse Series 7000 heavy duty and mechanical draft fan

New Fans For Heavy Duty At Elevated Temperatures

SERIES 7000 heavy duty and mechanical draft fans have been designed specifically for handling abrasive gases at elevated temperatures. In ratings to handle 10,000 to 50,000 cfm and pressures up to 70 in. of water, the fans can operate in a temperature range from 20 to 850 deg. F.

They are made for application where either abrasion or temperature requires radial blading with heavy tapered-blade sections for minimum stress. *Westinghouse Electric Corp.*

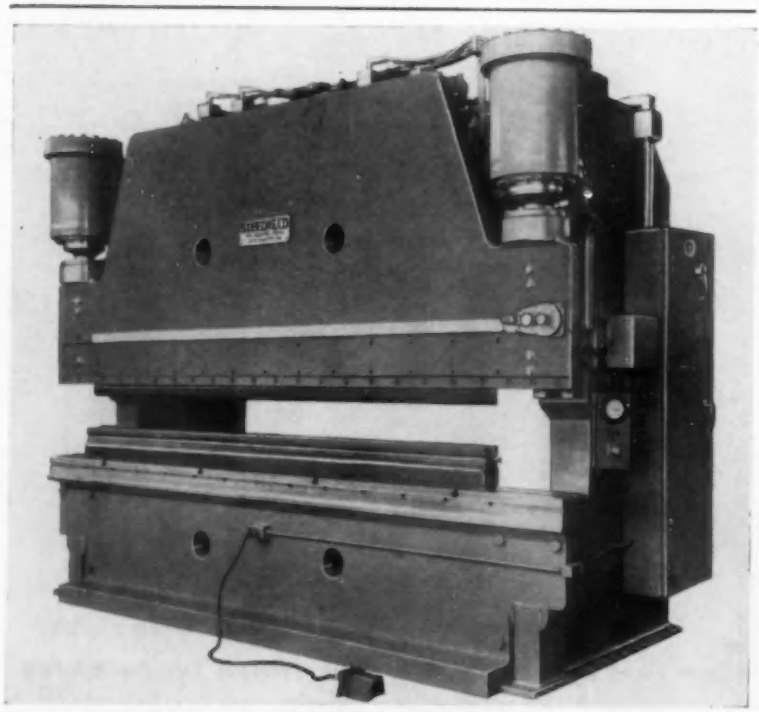
Circle 47 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Three Phase Rocker Arm Type Steel Seam Welder

The Federal Machine and Welder Co. has designed a special three phase rocker arm type steel seam welder which resistance seam welds stainless steels and titanium to titanium alloys. The firing of the machine is accomplished by a precision differential switch. Drive speeds are steplessly adjusted by a dc Thymatrol type motor drive system mounted to the lower arm. Range of drive speeds approximately 0.5 to 4 rpm. The machine has an essentially frictionless constant pressure type air pressure system, with electrode force adjustable from 250 to 2000 lb at 80 psi. Working stroke is ¾ in. Retraction stroke is 4 in.

Circle 48 on postcard for more data



Cleveland 500 ton Steelweld hydraulic press brake with a 14 in. stroke

Hydraulic Press Brake For Bending Mild Steel

A LINE of hydraulically operated press brakes is available in various capacities up to 2000 tons for bending mild steel, from 10 gage to 2 inches and in lengths to 30 ft.

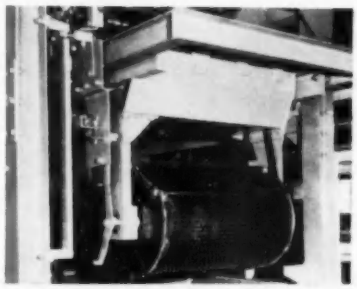
Because of the hydraulic design, the units can not be overloaded. Regardless of the size plate put into a press, it cannot be damaged; only the ram will stop, and it can be backed away immediately. Power is constant during the entire stroke, which varies from 12 in. for the smallest brake to 18 in. for the larger machines. *The Cleveland Crane & Engineering Co.*

Circle 49 on postcard for more data

Processing Barrel

THE horizontal barrel door seen on this processing barrel opens and closes automatically. The barrel is designed for cleaning, phosphating, blackening, Lubrite, Bonderizing, chromate treatments, pickling and similar processing.

After the barrel is loaded, a signal starts it rotating. Rotation actuates the mechanism that closes the door,



Hanson-Van Winkle-Munning processing barrel

which is held secure by a detent sping while the barrel passes through the treatment cycle. On completion of the treatment, barrel rotation is reversed to open the door and discharge the load. *Hanson-Van Winkle-Munning Co.*

Circle 50 on postcard for more data

Electronic Leak Detector

TYPE 24-110A leak detector is designed to locate and give precise indications of the size of leaks in pressure, vacuum, and hermetically sealed equipment.

A visual indicator is used both to locate leaks and determine their leakage rate. An audible alarm allows the operator to locate the leaks while concentrating on probing the suspected area. *Consolidated Electrodynamics Corp.*

Circle 51 on postcard for more data

Brazing Alloy

A NICKEL-BASE brazing alloy containing chromium and phosphorous for high-temperature service is for use in any application where high strength, minimum penetration of alloy into base metal and low nuetron absorption is required. Typical uses include honycomb sandwich panels, thermocouples, and electrical harnesses. It is called Nicrobraz 50. *Wall Colmonoy Corp.*

Circle 52 on postcard for more data

Versatile Tool Holder

MAXWELL universal-positioning UNI-MAX holds any 3/16 to ½ in. tool bit or boring bar in any horizontal work position on lathes, planners, shapers, slotters, etc. They can be used for carbide tip as well as high speed steel cutters.

Three sizes—5, 6 or 8 in. will handle all tool bits or boring bars from 8/16 to ½ in., round or square. *Maxwell Industries, Inc.*

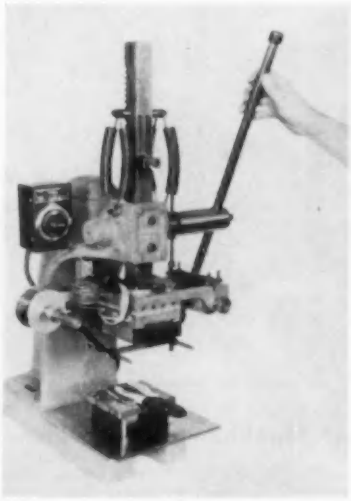
Maxwell UNI-Max tool holder

Circle 53 on postcard for more data

Hot Stamping Press

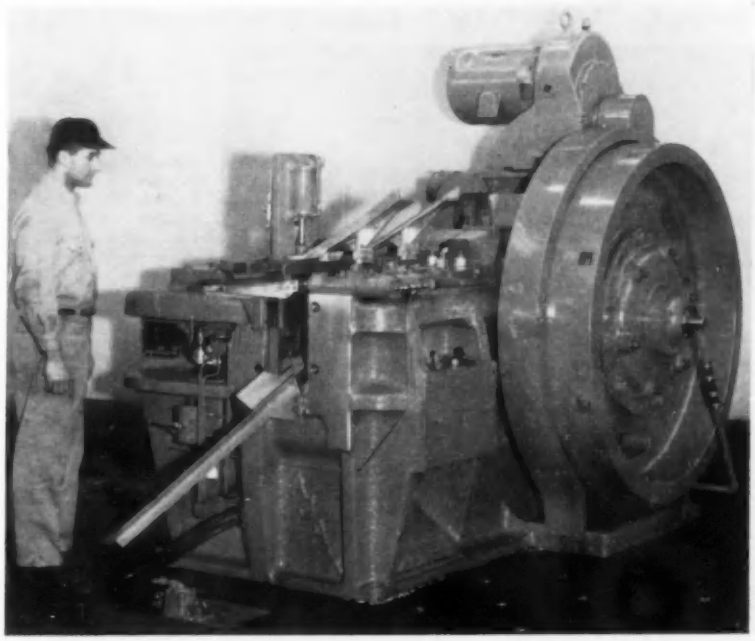
THE Hercules Acroleaf hot stamping press for marking plastics, fibre, fabrics, wood, paper and other materials hot stamps in color with roll-leaf.

Features of the machine include automatic roll-leaf feed, fool-proof adjustments in increments of less than 0.010 in. feed and automatic temperature control within the range of 100 to 550 F. Also a cartridge heated die holder, a spring return mechanism, controlled sensitivity and mark control with micrometer stop adjustment. *The Acromark Co.*



Acromark Hercules hot stamping press

Circle 55 on postcard for more data



Ajax forging machine equipped with an automatic feed mechanism

Forging Unit Equipped With Automatic Feeding Device

THIS Ajax 1½ in. forging machine is equipped with a feed mechanism which transfers the blanks automatically from the loading chute and down through the forging operations.

Various lengths of blanks can be fed into the machine. The blank is heated only on the end to be upset, and is lowered through the die operations in the throat of the machine by means of air actuated grips. The blank is rotated between operations to assure uniform heading. Production is continuous, heading a bolt in two operations and completing a finished forging with every stroke of the machine. *The Ajax Mfg. Co.*

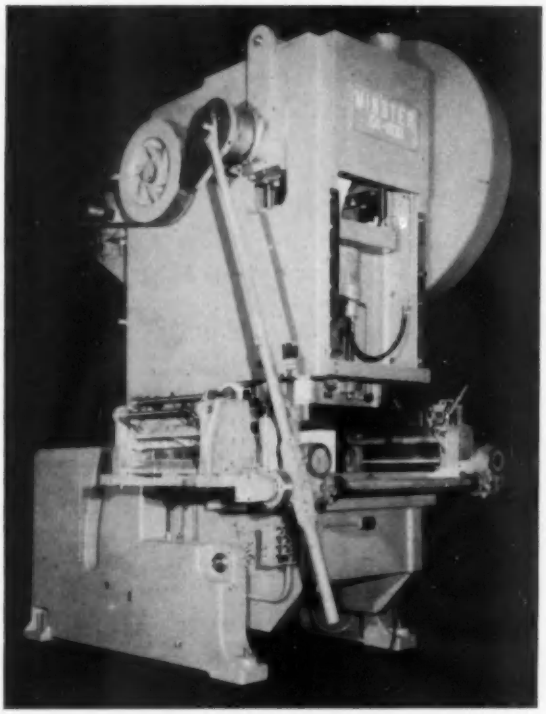
Circle 54 on postcard for more data

Lab-Size Furnace

THIS Rad-O-Glow furnace provides 60 sq-in. of radiation surface and its working chamber measures 4 by 8 by 4 in. It is for hardening high speed steels, annealing alloy steels, sintering powdered metals, copper brazing, aging, forging and similar operations. The unit features an automatic electronic indicator-controller with dual scale range (0 to 3000 F—0 to 1600 C). *Blue M Electric Co.*

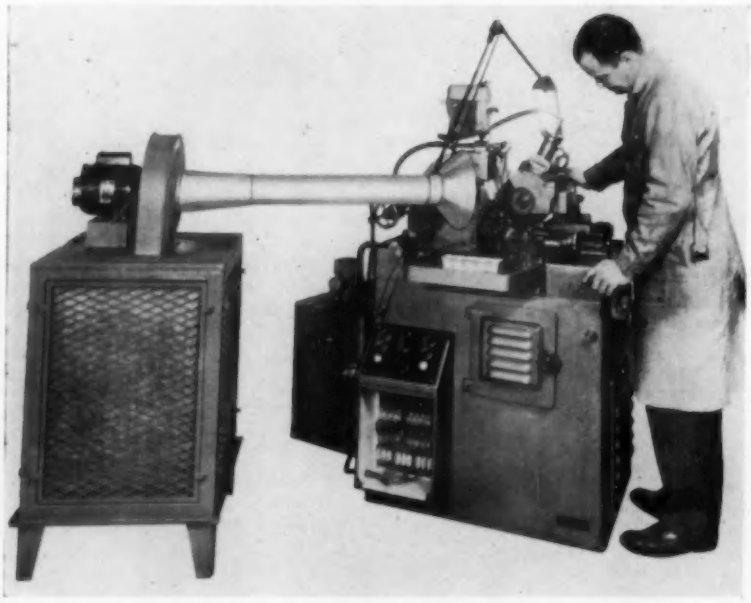
Circle 56 on postcard for more data

Single Point Gap Press Equipped With Automatic Feed



Series G1 single point gap presses in capacities ranging from 75 through 250 tons can be equipped with either single or double roll feed equipment. The single geared presses are available in both fixed base and inclinable types. These presses feature a large steel frame to achieve minimum deflection and the compressive strength needed to increase vibration dampening capacity. Electrical, air and recirculating lubrication controls are mounted within the legs of the press. (The Minster Machine Co.)

Circle 57 on postcard for more data



Torit mist collector for use with all wet machining operations

Mist Collectors For Use In Wet Machining Operations

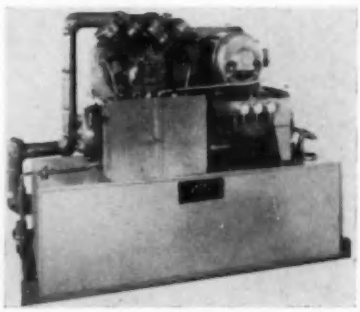
THREE specific models of mist and fog collectors have been designed for use in wet machining operations of automatic screw machines, tool grinders, surface grinders, centerless grinders, and other mist producing operations. Condensed mist is collected in the bottom of the unit and can be drained for future use, and the collector can be connected directly into the machine coolant system for continuous flow.

The units are designed to stand on the floor and, where preferred, can be mounted on walls or suspended from ceilings or overhead beams. *Torit Co.*

Circle 58 on postcard for more data

Packaged Acid Chiller

A PACKAGED acid chiller has been designed for cooling and tempera-



Mayer packaged acid chiller eliminates need of in tank or use of external heat exchanger

ture control of plating, anodizing and chemical solutions.

Basic components include a complete refrigeration system, insulated, hermatically sealed acid cooler and automatic controls and safety devices for proper operation and protection. It is completely automatic in operation. *Mayer Refrigerating Engineers, Inc.*

Circle 59 on postcard for more data

Portable Rivet Tools

Two lightweight riveting tools have been designed for setting small rivets up to 3/16 in. diameter in standard, overhead or blind applications. The hand tool is just slightly larger than household pliers and will set aluminum rivets of 3/32, 1/8 or 5/32 in. in diameter. The other, an air-hydraulic gun that weighs approximately 2 lb, will pull monel rivets up to 3/16 in. in size.

Both the powered and the hand tools can be used on break-stem or break-head "pop" rivets. *Pop Rivet Div., United Shoe Machinery Corp.*

Circle 60 on postcard for more data

Here's where it pays to *Play it Safe!*

When you want reliability . . . dependability . . . specify Steel Springs. Come to Burton to get them!

Trucks, buses, trailers, off-highway equipment, and private motor cars of almost every prominent make use Burton Leaf or Coil springs as original equipment.

When you're "on" in one, and you'll have a birdie if you sink it, you just can't afford to take chances . . . it pays to play it safe!

In modern automotive design and engineering, it pays to play it safe where performance really counts . . . especially in the springs that cushion the shocks and carry the load. That's why the time-proven dependability of Burton springs is an indispensable advantage.

Passing every critical test, not only on the proving ground but *in actual service*, Burton springs have proven equal to the toughest tasks—enduring extreme conditions of high speed, rough roads and heavy loading.

Why not play safe and follow the example of America's leading trailer and truck builders. Let Burton engineers solve *your* spring problems.

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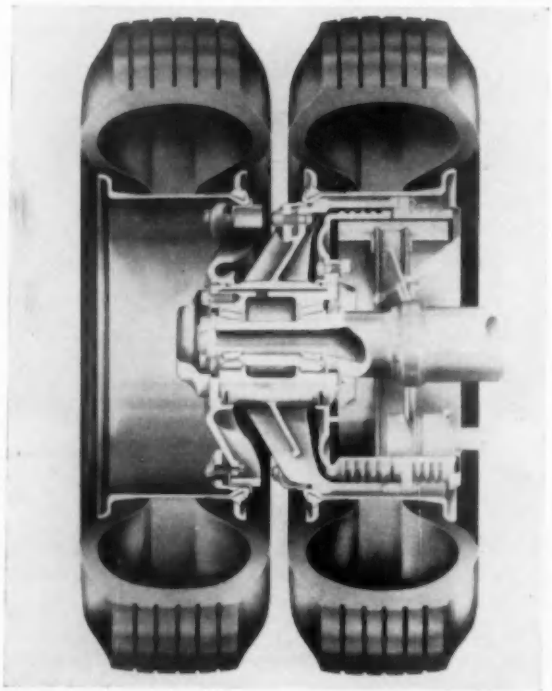
CHICAGO 32, ILLINOIS

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 73

Differential Dual Wheel Eliminates Tire Scuffing

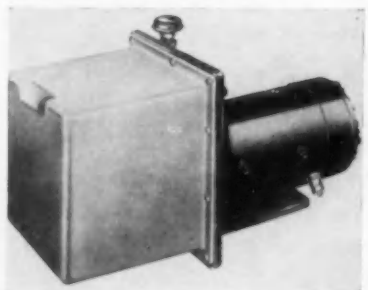


Anderson-Bolling Differential Dual Wheels are designed to eliminate tire wear due to scuffing and skidding on turns and rough roads, uneven tires and wear encountered in traveling crowned roads. This is accomplished by providing independent wheel rotation. Another feature is that each wheel has its own braking through use of dual brake drums actuated by the conventional braking equipment. The differential dual wheel is being made available to fit all 18,000 lb axles. All widths of 20 in. tires of demountable rim type may be used. (Anderson-Bolling Mfg. Co.)

Circle 70 on postcard for more data

Hydraulic Units

From standard pumps, motors, valves and reservoirs, a self-contained unit in many variations can be furnished to provide ½ to 4 gpm at 1800 rpm with pressures up to 2000 psi. Increased delivery at 3600 rpm.



Pumps can be supplied with check valve, relief valve, and manual or solenoid-operated lowering valves. Applications include tractors, snow plows, small dump bodies, tail gate unloaders and lift trucks. *John S. Barnes Corp.*

Circle 71 on postcard for more data

Air Braking Systems

Two air braking systems designed to provide smooth power stops and dependable control for heavy industrial equipment are available with the 14 by 6 or the 18 by 8 in. Wagner external shoe type brake. One system is for making service stops only. The brake is applied by an air actuating cylinder which has a return spring for quick release. The second system is for both service stops and for parking and holding operations. In addition to the air actuating cylinder, it has a spring-applied air-released parking cylinder. *Wagner Electric Corp.*

Circle 72 on postcard for more data

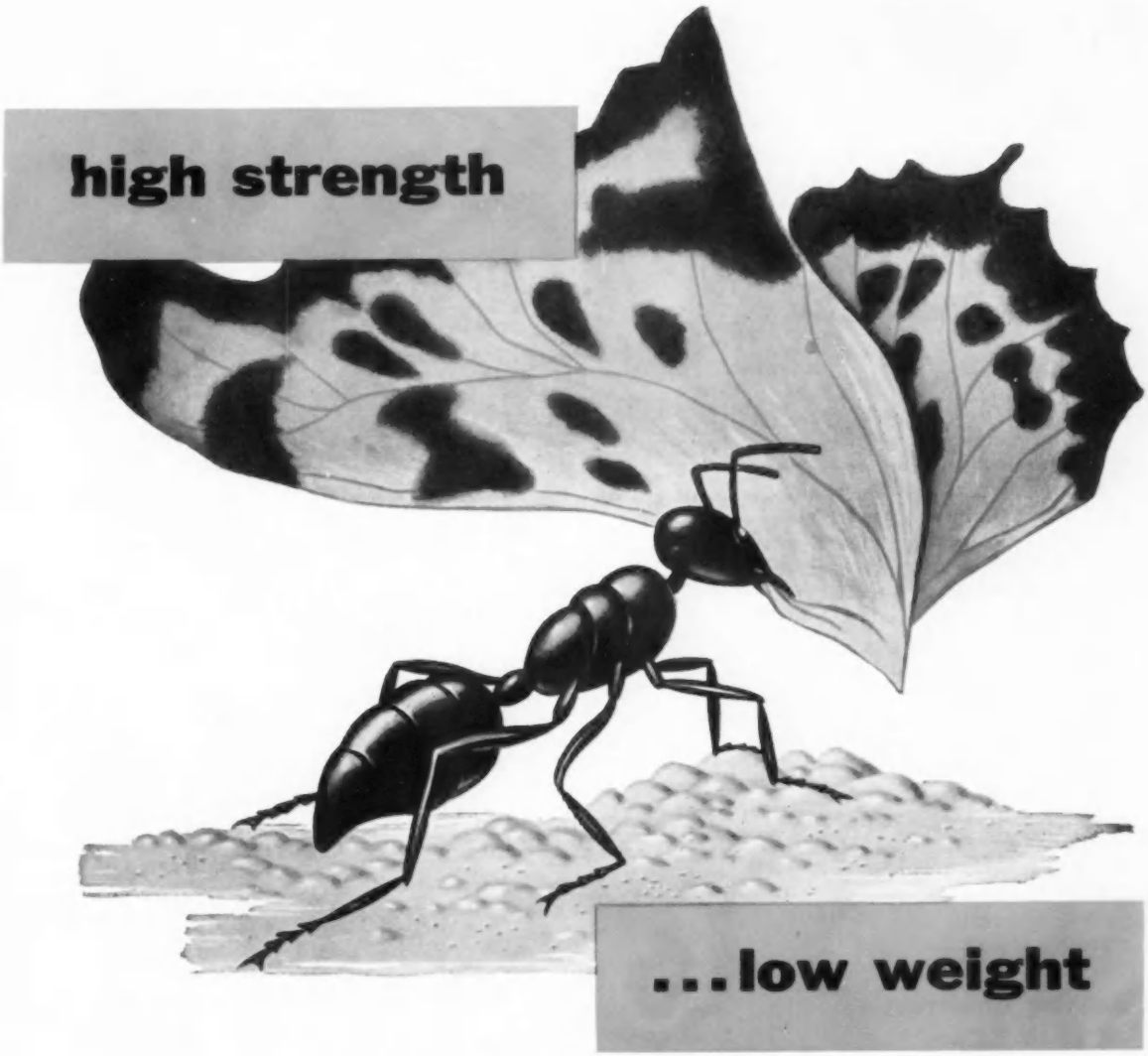
Sensitive Spark Plug

This pressure sensitive spark plug has been developed to analyze engine operation and combustion characteristics of various types of fuels when burned in internal combustion engines.

A high temperature strain gage bonded to a pressure sensitive diaphragm transmits an electrical signal proportional to engine cylinder pressure that can be displayed on an oscilloscope. Timing and indication of cylinder pressure, ignition, pre-ignition, knock, and other engine pressure pulsations are accurately sensed and displayed. This device permits unaffected engine operation. *Polyphase Instrument Co.*

Circle 73 on postcard for more data

(*Turn to page* 114, *please*)



Of all working insects, the ant is stronger per unit of weight. And Parish Pressed Steel Division of Dana Corporation, a leading manufacturer of automotive chassis and frames, uses A. W. Dynalloy steel for the same reason . . . high strength—low weight.

There are other reasons, of course. A. W. Dynalloy is

. . . easy to weld
. . . easy to form
. . . resistant to corrosion

As with Parish Pressed Steel, A. W. Dynalloy can help you get more value per dollar spent for your product. Send for our A. W. Dynalloy booklet which gives complete information. Write Marketing Division, Dept. DY-E90.

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The BUSINESS PULSE

Recent Figures Indicate Upward Tendencies of At Least Moderate Strength Are Firmly Established in Various Sectors of Industry. Construction Hits Record Volume. Fall Business Prospects Good

Key indicators registered further net improvement during the summer period, after allowance is made for the usual seasonal slack. This has given the recovery movement an increasingly solid appearance and renders autumn prospects rather good.

The pattern of industrial activity during July and August was certainly encouraging. Weekly steel output rose persistently after its holiday letdown in early July, with new-order experience also favorable. Strength was in evidence in many other industrial activities as well, so that there can be little doubt that total industrial production for the summer, seasonally adjusted, averaged well above the recession low of last April.

Building Construction At High Rate

Construction activity in the summer months was also strong, thanks in large part to well-defined recovery in residential building. In July —the latest month for which comprehensive data are available—total outlays for new work put in place set a record for the month, according to official estimates. August figures and those for the autumn period are also likely to make good reading, as they become available, since foreshadowing statistics, such as contract awards and housing starts, continue to be impressive. According to the F. W. Dodge Corp., July contracts for all types of construction ran some 24 per cent above those a year earlier, with virtually all categories sharing in the gain. Private non-farm housing starts rose to a seasonally-adjusted annual rate of 1.2 million units in July, 14 per cent above the figure a year earlier and about 26 per cent above the depressed levels recorded in February and March.

This Survey, published for the readers of automotive magazines exclusively in AUTOMOTIVE INDUSTRIES, has been prepared by the Guaranty Trust Company of New York

Retail Consumer Sales Show Some Improvement

Department stores experienced very satisfactory volume during both July and August, with sales in each month showing a year-to-year gain. Sales of back-to-school merchandise and other autumnal items were impressive just before Labor Day, thus creating good expectations for the fall season. Other types of retail outlets, considered together, apparently did not fare as well as department stores in the summer because of continued sluggishness in purchases of high-priced durable goods. At least this was true of July, when overall retail trade ran at about the same dollar total, seasonally adjusted, as in the preceding three months. Even so, retail trade in July did represent a definite improvement over the recession low experienced in February and March.

Personal Incomes Up

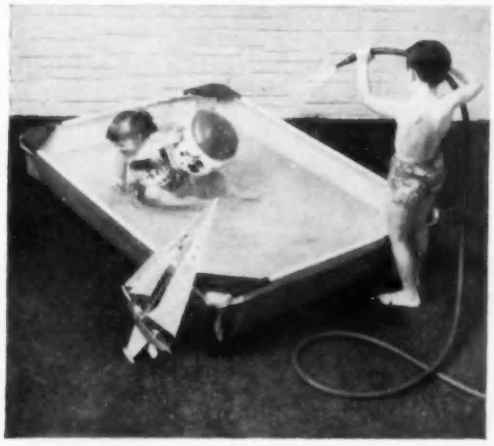
The outlook for emergence of a definite uptrend in overall retail trade for the autumn seems fairly promising, considering the rising tendency of personal income. This gained in July for the fifth consecutive month. The increase—without inclusion of certain lump-sum retroactive salary payments to Federal employes — amounted to about $2½ billion at an annual rate, bringing the cumulative annual-rate gain since last February to more than $8 billion. Without the lump-sum payments to Federal employes, the annual rate of personal income in July was $354.5 billion, a new all-time record. An increase in wages and salaries constituted the most important part of the July gain, as had been the case in the preceding two months. Earlier in the year, by contrast, an uptrend in transfer payments was the most important buttressing factor.

July Labor Market At About June Level

On the surface, at least, labor-market statistics for July appear somewhat disappointing. Total employment and unemployment estimates remained close to June levels, failing to show as much improvement as normally occurs in July. In reporting the figures, however, the Census Bureau noted that heavy rains in various parts of the country apparently curtailed some farm and outdoor activities during the period in which the job situation was surveyed.

This circumstance should probably be given some weight, particularly since certain sub-sections of the labor market that tend to be rather sensitive to business changes continued to show improvement. The Labor Department's estimate of non-farm employment, for ex-

(*Turn to page* 104, *please*)



ENJAY BUTYL

stretches the life of rubberized fabrics

Enjay Butyl puts *extra life* in a wide variety of rubber-coated fabrics through its superior resistance to tearing, cracking and aging. Leading manufacturers of wading pools, irrigation tubing, auto tops and outdoor covers choose versatile Enjay Butyl because they know it will withstand the traditional enemies of rubber—weathering, sunlight and abrasion.

In many different applications, versatile Butyl outperforms all other types of natural or synthetic rubber. Find out how Enjay Butyl can help you cut costs . . . build more performance into your products. Contact the Enjay Company for the whole story, plus technical assistance when desired.

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Enjay Butyl is the greatest rubber value in the world. It's the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

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Mercury's Rivera Plant

(*Continued from page* 62)

bodies, fenders, hoods, instrument panels, tires, seat cushions and other parts and subassemblies past employes who add one part after another until the car is finished. Each department feeds into the next unit in the system until all completed subassemblies come together in correct sequence on the final assembly line.

Only a few of the conveyors are used purely for transporting from one location to another. By far the majority carry material through finishing, painting, drying, assembly or other operations.

All movements are precisely scheduled and tied together by teletypewriter. The specific order for each car, which is transmitted to all production departments, specifies the body style, colors, engine, upholstery and lists of accessories required.

Sixty carloads of parts and materials will be required each day when the plant builds up to peak production. Two railroad tracks run the entire length of the south side of the building, and 36 freight cars can be accommodated inside the building at one time. In addition, 16 trucks can be unloaded simultaneously inside the building.

Trains of freight cars are classified outside the plant in such a way that when they are brought into the plant they can be unloaded near the area where the particular materials or subassemblies are stored. Engines, for example, are unloaded near the western end of the plant, while body stampings are unloaded near the eastern end.

Material is accessible for direct procurement by the production operators on a minimum of four hours' supply of bulky parts and a minimum of eight hours' supply of smaller parts.

Assembly of the body is started first, since that is by far the longest operation. After the body is built up, it is transferred to the second floor for painting. When it is returned to the first floor, it is trimmed with chrome, glass, door handles, etc., and then put in the 90-car storage area ahead of delivery to the final assembly line.

On the final assembly line it is set down upon the particular chassis specified by the teletype order. As the car goes down the final assembly line, front end assembly, tires and wheels and other components are added, all according to the order instructions. •

When the car reaches the end of the final assembly line, the engine is started and the car is driven right out to a quarter-mile test track, at the east end of the assembly building. This track permits operational testing of all cars.

After the test run, the car is brought back to the pre-delivery preparation section, where small repairs are made, paint is touched up if necessary, seat cushions are installed, and the car is given the final inspection and finishing touches under fluorescent lights.

About three and one-half days are required for this assembly cycle. However, a large part of this time is spent in body assembly, paint and trim. ■

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For over 30 years, EUREKA Cores and Radiators have served the automotive industry with utmost dependability. Our facilities, equipment, and personnel are available for your needs. We welcome the opportunity of integrating our specialized skills with your needs to help you achieve a well-planned production schedule.

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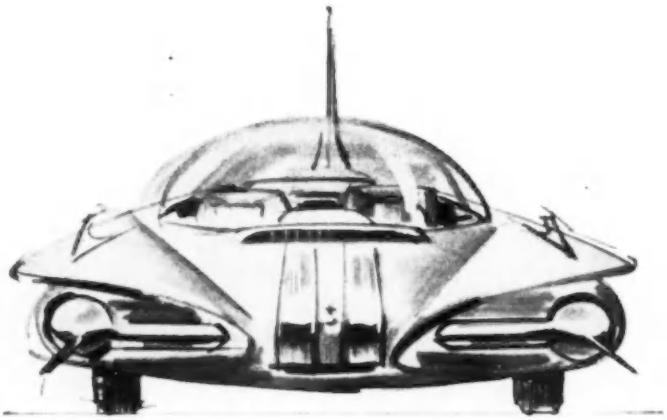

PUROLATOR'S DRY TYPE AIR FILTERS GIVE

COMPLETE DESIGN FREEDOM

With Purolator's new dry type air filters, there's no need to keep a constant, level bearing . . . to set the air cleaner on top of the block. There is no oil to spill, no level to be maintained. This makes it possible to place the filter anywhere at all . . . under the engine, on the side . . . wherever it allows the most design freedom.

Of course, the big advantage in dry type filtration is the optimum efficiency it affords. The Micronic dry type element is just as effective at low speeds as at high speeds. And instead of becoming less efficient with use, its already outstanding 99% efficiency *increases* to 99.7%.

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Filtration For Every Known Fluid

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PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period July 30 to August 25, inclusive.

AVCO MFG. CORP. LYCOMING DIV., Williamsport, Pa.
0-480-1 reciprocating aircraft engines—$1,242,078

B & C AUTO ELECTRIC, Anchorage, Alaska
Automotive parts indefinite quantity—$20,000

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Wheel assy, main—$6,181,680

BOEING AIRPLANE CO., Wichita, Kans.
B-52G airplanes, spares—$271,412,699

CATERPILLAR TRACTOR CO., Peoria, Ill.
Engine assembly 10 ea—$47,700

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio.
Milling machine, universal 4 ea—$89,544

CONTINENTAL AVIATION & ENGINEERING CORP. Detroit, Mich.
J69-T-9 engines for T-37A aircraft —$2,913,764

CURTISS-WRIGHT CORP., South Bend, Ind.
Automotive spare parts—2038 ea—$172,787

CURTISS-WRIGHT CORP., UTICA DIV., Utica, Michigan
Repair parts for Diesel engines 3789 ea —$94,176

CURTISS-WRIGHT CORP., WRIGHT AERONAUTICAL DIV., Wood-Ridge, N. J.
R1820-84B engines—$63,472
R1820-82A engines—$1,144,582
R3350-32W aircraft engines and data for P2V-7 aircraft—$904,404

DIAMOND T MOTOR TRUCK CO., Chicago, Ill.
Trucks, 4 ea—$30,265

DOUGLAS AIRCRAFT CO., INC., Charlotte, N. C.
Nike spare parts & components—$1,396,451

FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
Guided missile, surface to surface —$2,423,653

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.
Type MM-1 multi-purpose truck, 8 ton —$919,525

GENERAL ELECTRIC CO. SMALL AIRCRAFT ENGINE DEPT., West Lynn, Mass.
T58 Turboshaft Engine Preproduction Implementation—$669,235

GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel Assys, nose—$51,120

B. F. GOODRICH CO., B. F. GOODRICH AVIATION PRODUCTS, Dayton, Ohio
Spare wheels and data for B-47 aircraft —$3,409,728

B. F. GOODRICH CO., Dayton, Ohio
Wheel assemblies, landing gear—$635,916

THE GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assemblies, nose—$195,800
Brake assy, main wheel and spares—$463,965

THE FRANK G. HOUGH CO., Libertyville, Illinois
Tractor wheeled, warehouse 200 ea —$489,496

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
T33A aircraft—$728,374

MACK TRUCKS, INC., Washington, D. C.
Differential driving axle—$73,290

McCABE POWERS AUTO BODY CO., St. Louis, Mo.
Truck, maintenance, light utility, ¾ ton —471 ea—$160,941

NORTH AMERICAN AVIATION, INC., Canoga Park, Calif.
Rocket engines—$180,000

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
F-100F airplanes, spare parts, special tools and ground handling equipment —$17,389,040

OTIS ELEVATOR CO., BAKER INDUSTRIAL TRUCKS, DIV., Cleveland, Ohio
Truck, forklift, gasoline engine powered 450 ea—$489,496

STAHL METAL PRODUCTS, INC., Cleveland, Ohio
Truck, maintenance, light utility, ¾ ton —11 ea—$33,287

THIOKOL CHEMICAL CORP., UTAH DIV., Brigham City, Utah
M-16E-1 rocket engines in support of Matador Missile Program—$1,008,475

WESTERN ELECTRIC CO., INC., New York, N. Y.
Nike spare parts & components—$1,202,255

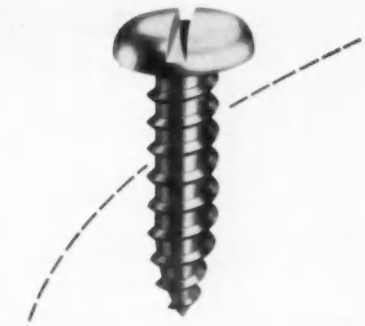
New Aluminum Bridge May Cut Federal Highway Program Cost

A new aluminum bridge, designed to be competitive with bridges made of other materials, has been developed by Fairchild Engine and Airplane Corp. The first model is now undergoing tests at Lehigh University.

Co-sponsors of the test project with Fairchild are Aluminum Co. of America, Kaiser Aluminum and Chemical Sales, Inc., Reynolds Metal Co., Metals Div., Olin Mathieson Chemical Corp., and the Bureau of Public Roads.

Sponsors said the basic idea was to apply aircraft building techniques to make an aluminum bridge that could mean big savings in the Federal highway building program. Highway officials estimate that 60,000 to 70,000 bridges will be built or rebuilt by 1970.

The prototype bridge is 24 ft wide and 50 ft long and supports a two-lane concrete roadway with a load limit of 15 tons per lane.



IN FASTENERS SOUTHERN IS progress

Southern Screw Company specializes in progress—through the manufacture of finer fasteners at less cost . . . If you have a production problem that can be solved by Southern Screw's quality, speed, or service, let Southern fasteners show you the way toward a profitable solution. Southern specializes in screws AND progress — and progress invariably includes profit for our customers!

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Southern SCREW COMPANY
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Automatic Testing of Air Suspension System Components

(*Continued from page 55*)

Jered engineers decided the chemical analyzer provided the best possibilities for accurate, production-rate leak detection despite the many apparent limitations. Testing with a gas analyzer is also subject to errors induced by lack of ventilation or too much ventilation. If there is not enough circulation, test gas can remain in the area and falsely register leaks on perfectly good units. If there is too much air circulation, the leak can be diluted to below the sensitivity of the equipment.

Nitrous oxide gas is used as a trace gas for it is non-toxic, non-flammable, safe and has no objectionable odor. Uniform dilution is an absolute must with nitrous oxide since at high concentrations, the gas has an affinity for oil. Any oil insemination would naturally contaminate the gas and make it unusable for testing.

Having high-pressure bottled nitrous oxide (N_2O) and air at 750 psi from the two-stage functional test compressor, the engineers attempted to throttle both nitrous oxide and compressed air through a proportioner at 375 to 400 psi to produce a properly diluted gas for leak detection. Unfortunately, they could find no proportioner that could guarantee precise mixing at these pressures. This was solved by throttling both gas and mixing air down to 75 psi where proportioning is accurate to within one per cent. The dilute gas is then re-compressed by the two-horsepower Ingersoll-Rand compressor to 375 psi for the leak test.

Since the air-oil separator may have a leak rate of 4 cubic inches per hour, the equipment must not determine which units leak; but which leak more than 4 cubic inches per hour.

The test chamber is internally contoured to the configuration of the air-oil separator, but is not air tight. An outlet in the chamber is connected to a small vacuum pump that discharges to the leak detector. In this way, a known amount of air is continually drawn through the test chamber into the leak detector.

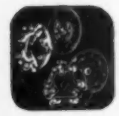
With a 10 per cent concentration of nitrous oxide and a known rate of air flowing through the chamber, 70 parts of nitrous oxide gas per million parts of mixture equals a leakage rate of four cubic inches per hour. At greater concentrations than 70 parts per million, the leak detector causes a red light to flash and the inspector rejects the part. Gas analyzers such as the leak detector used in this system are capable of detecting a few parts in a million. ■

ROCKFORD

MORLIFE® CLUTCHES

Help Heavy-Duty Tractors Keep "Busy at Both Ends"

Because ROCKFORD Morlife® CLUTCHES provide 100% more torque grip than previous type clutches of equal size, they help road machines do double duty. Easier operation is accomplished by reducing the required engaging pressure. 50% better heat disposal avoids down-time caused by burned or warped plates. Numerous maintenance records prove that MORLIFE clutches operate four to ten times as long without adjustment or plate replacement. Let this NEW type clutch help keep your heavy-duty machines ON the job and OUT of the shop.


Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

BW SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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CLUTCHES

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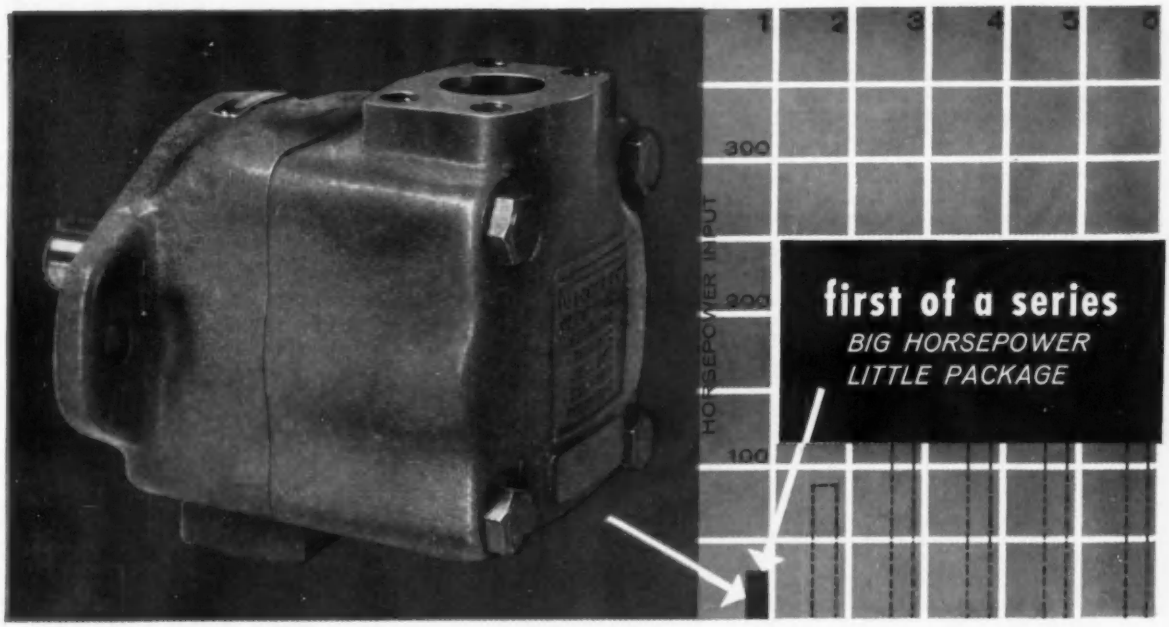


NEW VICKERS® high performance vane pump

• high speed • high pressure • high efficiency • high service life

NEW COMPACT DESIGN . . . more than twice the horsepower of previous pumps in the same package size.

NEW VANE CONSTRUCTION . . . positive vane tracking at all speeds assures efficient operation at increased speeds and pressures.

NEW SIZES not previously available . . . answers mobile equipment designers' need for greater hydraulic horsepower in limited space.

NEW PARTS INTERCHANGEABILITY . . . many common parts for single and double pumps (two pumps on the same shaft in one envelope). Lessens inventory requirements.

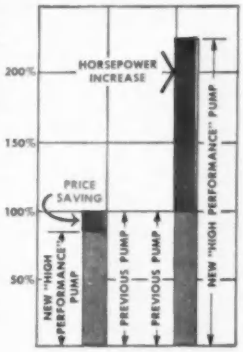
NEW 4-BOLT SAE FLANGE CONNECTIONS . . . will also accommodate user's 2-bolt flanges of the proper design.

NEW 2-BOLT MOUNTING (SAE 1959 STD.).

NEW REPLACEABLE PUMPING CARTRIDGE . . . all wearing parts of pump are incorporated in one replaceable cartridge. Easy field replacement without removing pump from its mount. Cartridges available in kit form.

MORE HORSEPOWER PER DOLLAR. The graph at the right makes a revealing comparison between this new pump and a previous pump of the same rated delivery. The new Vickers "High Performance" pump provides more than *twice the horsepower* at *less cost* while shrinking package size from 200 to 112 cubic inches.

The complete line of "High Performance" pumps (both single and double) is being readied for release. Size range will accommodate your largest requirements. This first model of the series is available in three ring capacities; 12 gpm, 14 gpm, and 17 gpm as shown in table below.



Model Number	Delivery-GPM 1200 RPM 100 PSI	Delivery-GPM 2000 RPM 2000 PSI	Input Horsepower @ 2000 RPM 2000 PSI	Package Size†	Weight
2V12A-**10	11.8	17.8	25.5	L. 5⅜" W. 4⅝" H. 5¾"	26 Lb.
2V14A-**10	13.6	20.4	29.0		
2V17A-**10	16.6	25.2	36.0		

†Exclusive of Shaft Extension and Mounting Lobes

8050

Write for new illustrated Bulletin No. M5108 for further details and performance characteristics.

VICKERS INCORPORATED
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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

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All the tough jobs are covered by Oakite's booklet on *"Cleaning and preparing metal in aircraft production"*. Just check this list of contents for reminders of operations that give you trouble:

	SEE PAGES
☐ Cleaning aluminum (with or without etching)	2
☐ Preparing aluminum for welding	3
☐ ChromiCoating aluminum before painting	4
☐ Stripping paint from aluminum, steel	5, 9
☐ Barrel finishing aluminum, steel, copper	5, 9, 11
☐ Cleaning magnesium	6
☐ Cleaning steel; derusting and descaling	7
☐ Preventing rust	8
☐ One-operation preparation for painting	9
☐ CrysCoating steel before painting	10
☐ Cleaning copper and its alloys	11
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FREE For your copy of this 16-page illustrated booklet, write Oakite Products, Inc., 58 Rector Street, New York 6, N. Y.

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Heat Treating Steering Gear Parts

(*Continued from page* 51)

natural gas. After removal from the furnace, the work and the fixture are "direct quenched" in oil.

This heat treating operation is designed to obtain a Rockwell hardness of C 58-63, and a minimum carburized case depth of 0.045 to 0.075 in., depending on the size of the part. Because the cams are critical to the proper functioning of the steering assembly, they are given a 100 per cent hardness test.

Articulated Fixture Designed With High Alloy Castings

Since the fixture on which the work is suspended goes through the same cycle as the cams, it must resist the same high temperatures and thermal shock, in addition to providing a solid support for the heavy load. This fixture is designed as a group of individual "leaves" loosely pinned together through box members in the form of a flexible grid. The leaves—some as long as 39½ in.—are cast of type HT alloy (Alloy Casting Institute designation) which is nominally 35 per cent nickel, 15 per cent chromium, about 0.50 per cent carbon, with the balance iron and small amounts of silicon and manganese.

During the heat treating cycle the leaves rest on an HT alloy support ring casting in the furnace, acting as beams to support the load. The high alloy cast leaves in this sectional, articulated design have sufficient strength to sustain the load without need for bracing that would cause distortion from thermally-imposed stresses. The slotted hollow box members, also cast of type HT alloy, serve as spacers to keep the leaves properly positioned laterally while permitting them freedom to expand longitudinally. These castings, in addition, act as girders to support the leaves when the load is lifted from the furnace for transfer to the quench tank.

HEADQUARTERS

for tough valve gear problems

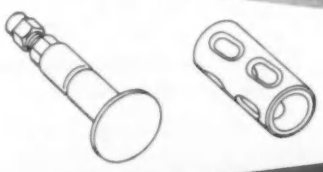
When you're facing difficult problems involving valve gear, the men to see are Chicago's tappet engineers. For, in 25 years of specialization on valve train parts, we have encountered and solved many problems similar to yours.

Applications, such as those illustrated, are typical examples . . . and the operational records established by Chicago tappets of all types in more than 25,000,000 engines are the best testimonial to their success in meeting the toughest industry requirements.

Even when your engine does not present unique requirements in valve gear design, checking with Chicago can often assure a performance bonus. Chicago's hydraulic tappets, for example, assure longer trouble-free life, reduced starting noise, and quieter operation.

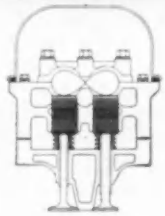
For Any Engine

Car, truck, tractor, diesel . . . aircraft, outboard, power mower, or industrial . . . whatever your type of engine, big or small . . . it will pay you to consult Chicago's development engineers *while you are still in the preliminary design stages.*

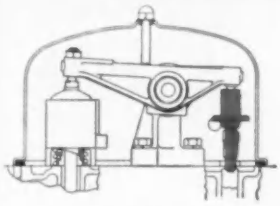


Write or wire our Tappet Division today

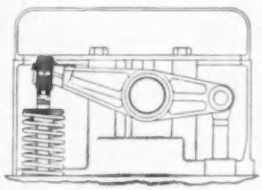
Hydraulic and Mechanical Tappets (Barrel or Mushroom Type) of Alloy Steel, Hardened Alloy Cast Iron, Chilled Iron, or Alloy Chilled Iron • Push Rods • Adjusting Screws



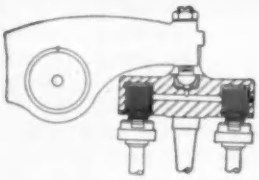
Hydraulic Inverted Cup Type Unit



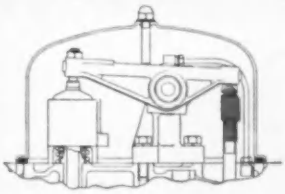
Push Rod Type with Compression Release Application



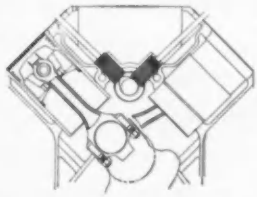
Threaded Type Rocker Arm Unit



Dual Valve T-Bridge Hydraulic Application



Hydraulic Unit on End of Push Rod



V-8 Automotive Hydraulic Tappet Application

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

Industry News

(*Continued from page* 38)

Westinghouse Finds New Class Of Thermoelectric Materials

Westinghouse Electric Corp. announced that its scientists have discovered a new "essentially unexplored" class of materials which can convert the heat of a burning fuel directly into electricity. Such substances, called thermoelectric materials, produce electricity without the use of moving parts of any kind.

Dr. Clarence Zener, director of Westinghouse research, said that the new thermoelectric materials are the first to meet the requirements for efficient power generation; that is, they must be able to operate at temperatures in the range of 2000 to 3000 F, and must be nonconductors of electricity.

Dr. Zener described the new materials, which are of the ceramic type, as "mixed valence compounds of the transition metals." The transition metals, he explained, are a group lying near the center of the natural table of elements and include iron, nickel, and manganese.

The advantage of the new compounds compared with solid state materials which have been proposed for thermoelectric power generation is that they are inexpensive, easily available, simple to prepare, and not composed of critical elements in short supply.

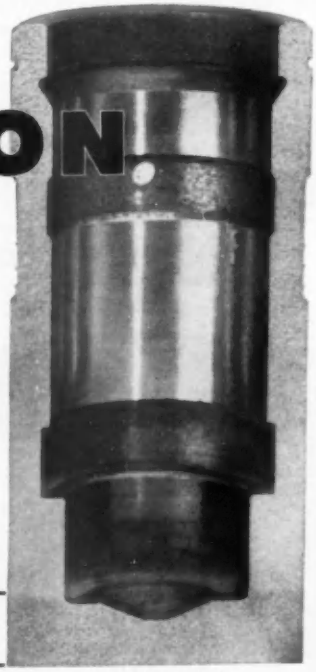
Dr. Zener said that work with the new materials is still in its early stages and that their greatest promise for the near future is in specialized applications requiring small quantities of electric power.

Westinghouse scientists do not anticipate that thermoelectric power will ever supplant present methods of power generation, Dr. Zener added, but if it ever proves feasible its function will be rather to supplement conventional methods or provide power where such methods are undesirable or impractical.

JOHNSON

brings you the latest development in heat treatment of hardenable iron tappets.

INDUCTION HARDENED TAPPET FACE



unretouched photo, twice size

Hardenable iron tappets have helped to solve many of the cam and tappet face wear problems in modern overhead valve engines. Now, this improved method of heat treating by Johnson provides greater uniformity, excellent wearing characteristics, PLUS lower cost. We'll be happy to show you proof of this latest tappet improvement.

Johnson TAPPETS

"Tappets are our business"

JOHNSON Jp PRODUCTS INC.

MUSKEGON, MICHIGAN

M-H Industrial Group Makes Changes in Executive Setups

Organizational changes designed to strengthen the Industrial Products Group of Minneapolis-Honeywell Regulator Co. have been announced by vice-president Henry F. Dever.

Realignment of executive personnel, he said, will enable the Industrial Products Group to improve its product planning. The group is responsible for directing the company's activities in industrial instrumentation and high-speed data-processing.

Under the new set-up, George M. Muschamp becomes group vice-president—engineering, and O. B. Wilson, formerly Brown sales vice-president, is named group vice-president—marketing. John M. Wilson, head of design and development, is named director of engineering, relieving Mr. Muschamp of direct responsibility for Brown's engineering department.

Dever also announced appointment of R. L. Mallory of Dallas, Southwest regional manager, to the newly created position of sales manager of the Industrial Products Group.

In other assignments, J. A. Robinson, field sales manager, was appointed sales manager, of Brown Instruments division; Howard J. MacDonald, assistant general manager, was made general manager of the Valve Division; and H. Earl Benson, senior sales engineer in the Cleveland regional office, becomes sales manager for Rubicon division.

GREATEST NAMES in GAS ENGINES — Carburetion by ENSIGN

ENSIGN CARBURETOR COMPANY

1551 E. Orangethorpe, Fullerton, California
Branch Factory: 2330 W. 58th Street, Chicago, Illinois

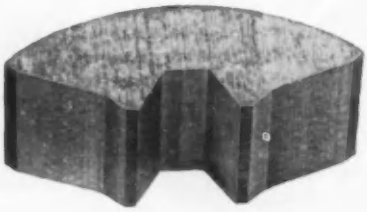
This most impressive group of engine builders make up the Ensign orbit of ORIGINAL EQUIPMENT MANUFACTURERS using our products as standard factory equipment on natural gas engines. We are indeed proud of and grateful for the privilege of serving these outstanding leaders for many years. These engines operating 'round the clock year in and year out in nearly every country of the world and in the hands of the most inexperienced, provide DEPENDABLE power for petroleum, agricultural and industrial uses. The outstanding DEPENDABILITY of the gas engine, which we are proud to share, is a tribute to the engine designer who through many decades has developed to a high degree of proficiency both engine and carburetor techniques.

WORLD BESTOS BRAKE LINING

...any *shape*...any *size*...any *friction* to meet your most exacting requirements!

ROUND

as for Race Cars

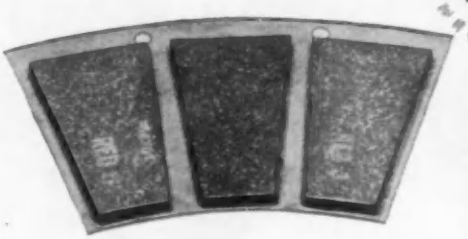


INTRICATE

as for Industrial Brakes

TINY

as for small Precision Assemblies



BIG

as for giant Forming Presses

● World Bestos is currently helping many manufacturers solve difficult braking problems with special friction formulas that assure dependable stopping power, non-fading performance and extra long life.

World Bestos offers extensive research and development facilities and more than 30 years' specialization in friction material manufacture. Modern, high-capacity plant assures on-schedule delivery.

● **Write for new Industrial Brake Folder . . . or let us know your specific requirements. Send prints and specifications if possible. Engineering assistance available.**

WORLD BESTOS NEW CASTLE INDIANA

DIVISION OF THE **Firestone** TIRE & RUBBER CO.

Industrial and Automotive Brake Blocks and Linings · Transmission Linings · Special Clutch Facings · Vibration Controls · Sheet Packing

News of the MACHINERY INDUSTRIES

(*Continued from page 76*)

Total allocations in the tools-for-schools program amounted to 2745 during the first six months of 1958. This compares with shipments of only 1200 in all of 1956 and 1750 in calendar 1957.

Officials at the Department of Health, Education and Welfare, which handles the tools-for-schools program, officially estimate 5000 tools will be shipped to schools in the current fiscal year. Privately, however, they say the total could easily climb by another thousand or so.

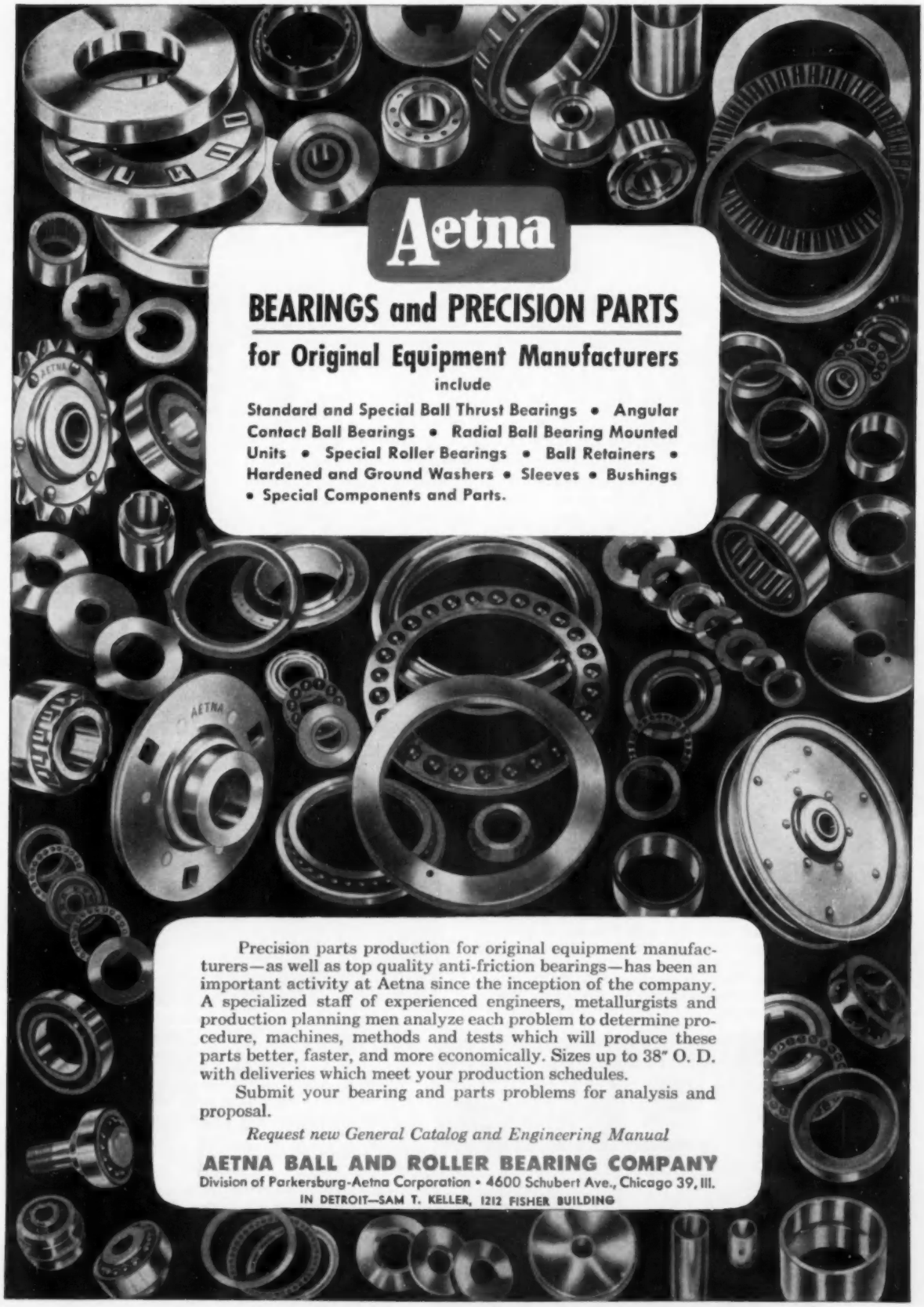
Requests from schools total in excess of 100,000 units. But, the speedup in shipments will accelerate at a relatively low rate. One of the factors involved is that the charges of several hundred dollars on each tool sent to the schools usually must be budgeted in advance. Also, the number of requests must be discounted because all requirements cannot be physically met.

It has been variously estimated that around 12,000, or between 12,000 and 15,000 machine tools will be declared surplus to Government needs this year. The NIER storage program had anticipated taking about 5000.

Around the Industry

Baker Brothers, Inc., has purchased from Gear Grinding Machine Co. the Detroit Screwmatic 750, a single-spindle bar automatic with ¾-in. diam capacity. Name of the machine will be changed to Baker Automatic Bar Machine. Among personnel transferring to Baker Brothers are John Brophy, Robert Rack and Charles Cagnon. Brophy will continue in charge of sales.

Landis Tool Co. — Walter P. Lotz has been appointed vice-president in charge of sales; John A. Cover promoted to sales manager; and John J. Keane made assistant sales manager.


Aetna
BEARINGS and PRECISION PARTS
for Original Equipment Manufacturers
include
Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Special Components and Parts.
Precision parts production for original equipment manufacturers—as well as top quality anti-friction bearings—has been an important activity at Aetna since the inception of the company. A specialized staff of experienced engineers, metallurgists and production planning men analyze each problem to determine procedure, machines, methods and tests which will produce these parts better, faster, and more economically. Sizes up to 38" O. D. with deliveries which meet your production schedules.
Submit your bearing and parts problems for analysis and proposal.
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Division of Parkersburg-Aetna Corporation • 4600 Schubert Ave., Chicago 39, Ill.
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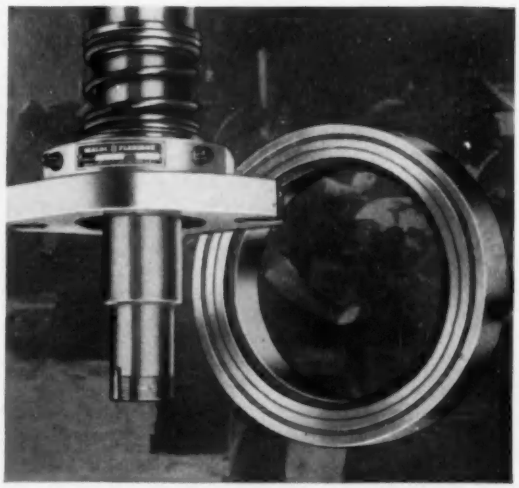
PROOF OF QUALITY

REPUBLIC COLD DRAWN CARBON BARS are used in the manufacture of Shotgun Barrels by Harrington and Richardson, Inc. Mr. Arthur F. Hird, Chief Engineer, states his reasons in a letter reproduced on the opposite page. For information on how Republic Cold Finished Steel may help solve your manufacturing problems, contact your local Republic office or mail coupon.

CHATEAUGAY PIG IRON QUALITY IS PROVED time after time by the superior results achieved in producing giant mill rolls. One such roll is shown being finished to an extremely smooth surface. Other requirements include high strength, wear and heat resistance, and ease of machinability. Chateaugay, Republic's exclusive pig iron fills the bill perfectly. For details on low phosphorus, copper-free Chateaugay, mail coupon.



A LATHE FINISH OF GROUND SURFACE QUALITY is reported by Sealol Corporation, Providence, Rhode Island, in the production of mechanical shaft seals using Republic Free-Machining ENDURO® Stainless Steel Bars. In addition, ENDURO's excellent physical properties overcome shaft wear and attack by corrosive elements. Republic can furnish ENDURO in a complete range of analyses, in the best form to meet your needs. Send coupon for data.

HIGH QUALITY IRON POWDER PARTS are easier to produce using Republic CDF Iron Powders. CDF means Controlled Dimensional Factor in three types of powders—Type "G" for growth, Type "N" for normal (no dimensional change), and Type "S" for shrinkage after sintering. Send coupon for booklet ADV-763 containing full information on test evaluations, chemical composition, and physical properties of Republic CDF Iron Powders.

HARRINGTON & RICHARDSON, INC.

MANUFACTURERS *Since 1871* *Fine Arms*

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MASSACHUSETTS
U.S.A.

PLEASANT 7-6341
CABLE ADDRESS HARRICH

January 1958

Republic Steel Corporation
Republic Building
Cleveland 15, Ohio

Gentlemen:

Ever since Harrington & Richardson, Inc., manufacturers of all types of small arms, was organized in 1871, their Metallurgists and Engineers have been experimenting to find the most suitable material for the manufacture of Shotgun Barrels. The steel required had to be of uniform structure and high quality with physical and dimensional stability. It also had to be well suited for machining at higher feeds and speeds, effect longer tool life, produce better surface finish, and provide the higher ultimate strength required by today's high pressure, smokeless powder ammunition.

Manufacturers of Gun Barrels are all too familiar with the specific problems involved. Operations such as Deep-Hole Drilling, Deep-Hole Reaming, Deep-Hole Boring, Burnishing, and Long-Length Turning operations as affecting polishing can make or break a process if such operations are beset by material problems causing high operational costs and excessive rejects.

Republic Cold Drawn Carbon Bars are the answer to the problem. For the past five years Harrington & Richardson, Inc. has been using one and three-sixteenth diameter, cold finished, magnetic tested, stress relieved bars with a maximum of success.

Harrington & Richardson, Inc. has found that the uniformity of structure eliminates hard spots in machining - the bugaboo of surface finish - and produces a barrel of uniform strength capable of withstanding great forces.

The quality of the steel is reflected in the surface finish achieved. Republic Cold Drawn Carbon Bars are relatively free of sub-surface defects and incipient cracks appearing at the final turning and burnish "bore buttoning" operations. Its physical and dimensional stability reduces the need for constant machine adjustments and straightening operations. All of these characteristics combine to reduce rejects to an absolute minimum effecting low operational and material costs.

Republic Steel Corporation can indeed be proud that this material enables Harrington & Richardson, Inc. to offer higher quality firearms to sportsmen at very moderate prices.

Very truly yours,

A F Hird

Arthur F. Hird
Chief Engineer

AFH:em

ALL AGREEMENTS ARE CONTINGENT UPON STRIKES, ACCIDENTS AND OTHER DELAYS UNAVOIDABLE OR BEYOND OUR CONTROL.

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World's Widest Range of Standard Steels and Steel Products

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☐ Cold Finished Steel Bars ☐ ENDURO Stainless Steel
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☐ Please send Booklet ADV-763 on Republic CDF Iron Powders

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

THE BUSINESS PULSE

(*Continued from page* 88)

ample, showed a somewhat smaller decline than usual for July, with strength in the durable-goods manufacturing sector a prominent feature. In addition, the factory work week held steady, whereas normally it registers some decline in the vacation period. Average weekly earnings of manufacturing workers increased, reflecting primarily a one-cent rise in hourly earnings to a level three per cent above that a year earlier.

Business Pattern Developing Strength

All things considered, it seems clear that by July there were no longer any real hints of recession in the economy and that upward tendencies of at least moderate force were already well established in various sectors. Data for August are incomplete at this writing, but insofar as available figures can be judged, they do not indicate any significant departure from the pattern of slowly developing strength.

Other Factors

The pace of recovery through the remainder of the year is likely to depend on whether consumer interest in durables is renewed. On this score, there is some basis for hope, in view of the rising trend of consumer income, the housing upturn, and the reduction which has been effected in automobile installment credit during the past year.

Beyond the immediate future, the pace and extent of recovery will further depend on how quickly the decline in capital spending is reversed. In mid-September the Government will issue the results of a survey of capital-spending intentions conducted in late July and August, and it will be important to see whether recovery signs have caused businessmen to upgrade spending plans.

"PONY POWER" MOTORS

that give stamina to your products

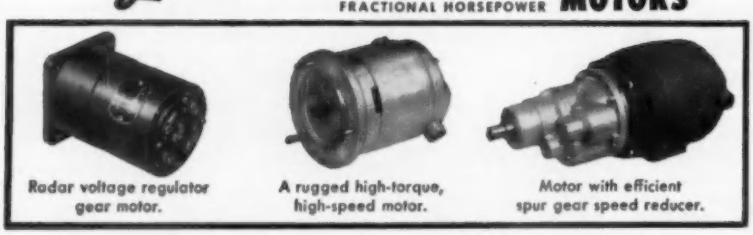
Lamb Electric ***fractional*** horsepower motors, like the small horses of the famed western-pioneer-day Pony Express, are developed for *stamina.*

Their dependability, and efficiency (optimum weight-size-horsepower ratio) are qualities that result from proper design and careful manufacture by personnel with many years of experience in the small motor field.

May we demonstrate how Lamb Electric Motors can bring these advantages—and also perhaps lower costs—to *your* products?

THE LAMB ELECTRIC COMPANY • KENT, OHIO
A Division of American Machine and Metals, Inc.
In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

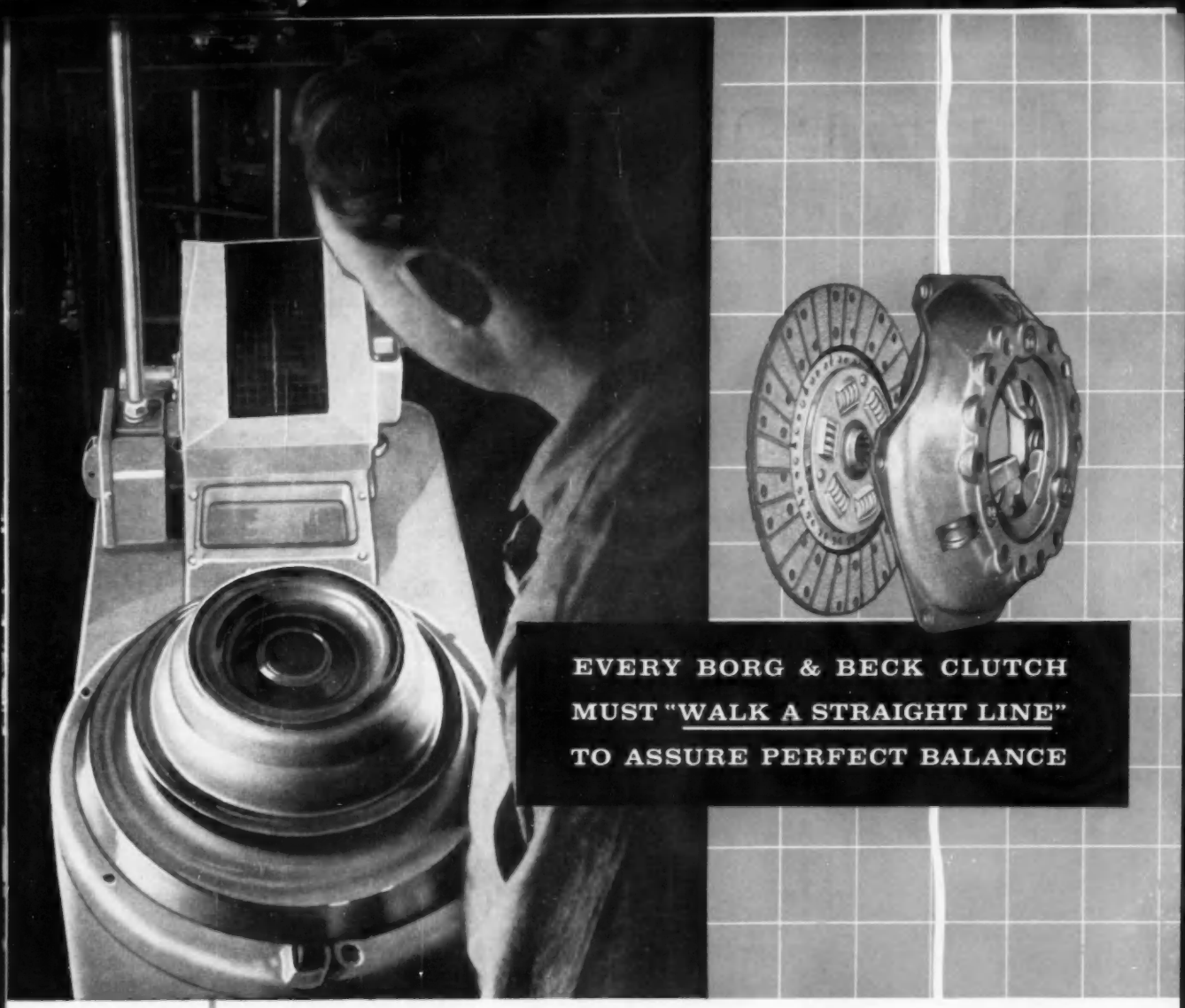


Radar voltage regulator gear motor. A rugged high-torque, high-speed motor. Motor with efficient spur gear speed reducer.

BOOKS . . .

THE POLYAMIDES, *by Donald E. Floyd, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $4.50.* This book contains information on the basic chemistry and raw materials of polyamide resins, methods for their manufacture, and their key properties. Major applications are covered, including fibers and filaments, coatings and films, moldings, extrusions, adhesives, inks, castings, and sealants. Throughout the book, an effort is made to relate applications to resin structure. The author also explains why certain polyamides are used in certain fields and predicts future trends.

PLASTIC SHEET FORMING, *by Robert A. Butsko, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $4.50.* This handy guide covers the entire field of plastic sheet forming—from product design through manufacturing. The book explains sheet forming use in over 14 different kinds of products and includes material selection, equipment, molds, sheet decoration, and costs. Altogether an excellent introduction to the subject for the engineer and designer, as well as a useful reference for the manufacturing technician who wants to acquaint himself with the available forming techniques.



EVERY BORG & BECK CLUTCH MUST "WALK A STRAIGHT LINE" TO ASSURE PERFECT BALANCE

Probably the most important single quality in a clutch is *balance*—because balance means smoothness of operation, not only of the clutch but of the engine as well.

That's why Borg & Beck clutches are checked for balance, at operational speeds, on specially designed test machines. Even the slightest unbalance is instantly detected and carefully corrected. Perfect balance is assured, as shown above, when the electric beam of the oscillograph is vertically straight on the calibrated screen. And every Borg & Beck clutch must "walk this straight line" before it passes inspection.

This is typical of the extra care that goes into every step in the making of Borg & Beck clutches. It is your assurance of top quality, top performance, top value.

BORG & BECK®

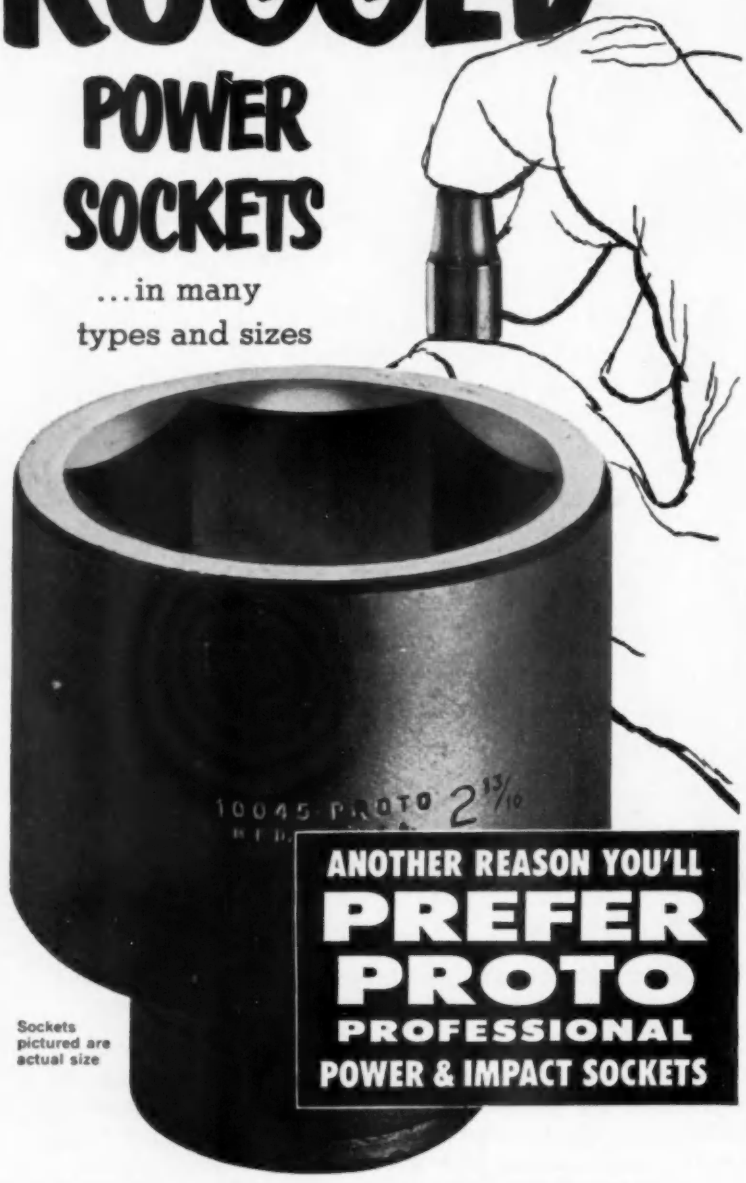
THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

RUGGED POWER SOCKETS

...in many types and sizes



Sockets pictured are actual size

ANOTHER REASON YOU'LL PREFER PROTO PROFESSIONAL POWER & IMPACT SOCKETS

Protoloy alloy steels, scientific heat treatment and advanced design give Proto sockets extra strength... plus... high safety factor, long life, low cost. Send 10¢ for 84-page tool catalog. Proto, 2209 Santa Fe Ave., Los Angeles 54, Calif.

MANY TYPES AND SIZES

Standard sizes
from 3/16" opening in 1/4" drive —to 3 1/8" opening in 1" drive.

Special sizes
up to 9 1/4" opening in 2 1/2" drive.

PROTO TOOLS
PROTO means PROfessional TOols
DIVISION OF PENDLETON TOOL INDUSTRIES INC.

SHORTIES

The average passenger car today has 24 lights, or two more than the average home uses for illumination.

•

Approximately 2½ tons of raw materials go into the making of every ton of ingot steel that is poured from the furnaces.

•

Since 1900, while population about doubled, steelmaking capacity was multiplied over six times.

•

Carbon steel is the most abundant and lowest in price of all metals used in our economy. In 1956, carbon steel accounted for 91 per cent of our total steel output.

•

The steel industry's 1956 payroll was four times that of 1940, and the number of employes had increased 28 per cent by the end of this period.

•

In 1956 steel's payroll totaled over $3½ billion. This did not include additional payments made by the companies for social security, pensions, and insurance.

•

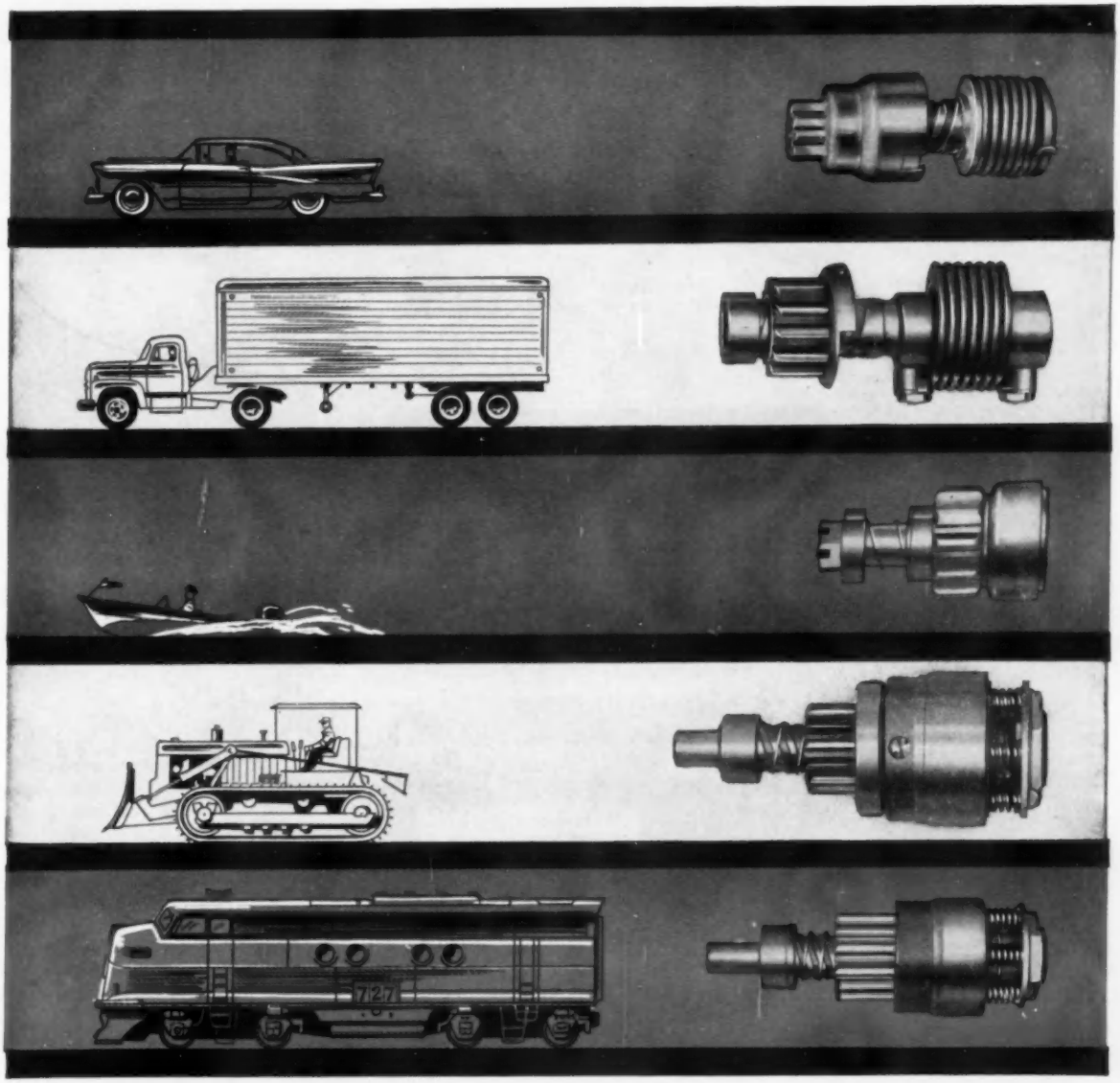
The scheduled airlines set new traffic highs in 1957. They carried more people and more property more places and for longer distances than ever before.

•

In 1957 the airlines flew: 49,339,000 passengers; 31,243,100,000 revenue passenger miles; 160,689,000 ton miles of U. S. mail; and 507,678,000 ton miles of freight.

•

At the end of 1957, scheduled airlines had on order 474 new aircraft for delivery between 1958 and 1961. Making up the airline order were 230 pure jet planes, 167 turbo-props, 70 piston aircraft and 7 helicopters.



BIG OR SMALL . . . BENDIX DRIVES START THEM ALL

Throughout the world of transportation it's an accepted fact that *you start with Bendix!* And it's not surprising. Bendix* Starter Drives have been synonymous with dependability for fifty years in the automotive field. They've proved themselves just as reliable on submarines, aircraft, earth movers, outboard motors, helicopters. In fact, every type of internal-combustion engine ever built has used a Bendix Starter Drive. Hospitals use Bendix Drives to activate their stand-by equipment. Air raid sirens across the country are started with Bendix Drives. It's logical to believe that such universal acceptance indicates a standard of quality which no other manufacturer has been able to match. Need we say more?

*REG. U. S. PAT. OFF.

Bendix-Elmira, N.Y.
ECLIPSE MACHINE DIVISION

Bendix
AVIATION CORPORATION

Latest Developments in Impact Extruded Aluminum Alloys

By R. A. Quadt
BRIDGEPORT BRASS CO.

For many years the use of aluminum impact extrusions has been confined to non-stressed applications. Generally the aluminum was commercially pure 2S or other low alloy moderate strength composition. Very little use was made of the harder, heat treatable analyses because of the higher cost associated with heat treatable parts and the inherent difficulties with tools, presses, and lubrication designed for the softer materials.

Many of these restrictions have been eliminated by developments consummated in the last few years. The problems associated with strong heat treated alloys have been solved by improved techniques for producing extrusion blanks, new lubricants and application methods, more rigid tooling, and fast acting hydraulic presses. Cost has thus been brought into line so that production quantities of complex shapes can be supplied in the heat treated temper with 80,000 psi tensile strength, at negligible additional cost, as compared to 2S with 23,000 psi tensile strength.

Forged Pistons

In these days of high horsepower, high compression engines, the battle of the piston designers waxes as it always has since the inception of the internal combustion engine. All American cars now have standardized on aluminum pistons, and all are cast. While excellent service has been rendered by the cast piston, a few companies continue to eye the forged piston produced by impact extrusion techniques. Various reasons are given for this interest: inherent lower cost, fewer machining rejects, reduced automatic machine tool maintenance, lower unit piston weight due to higher strength.

A few tests have been conducted at Hunter Douglas to develop a heat treated impact forged piston that would be stable at operating conditions. After solution heat treatment, quenching, and a complex aging treatment including stabilizing at 400F the following typical properties were obtained: 64,000 psi tensile strength, 54,000 psi yield strength, eight per cent elongation, Brinell hardness 110 to 120. Tensile specimens were machined from the piston skirt.

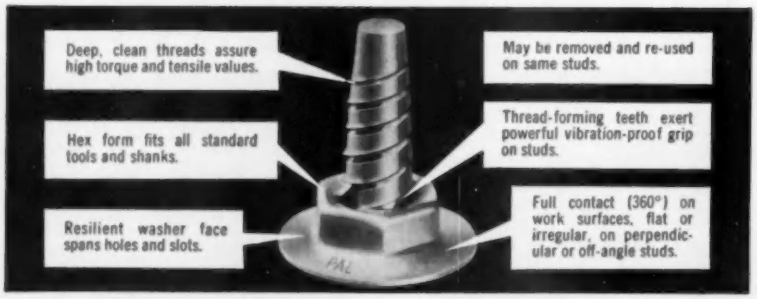
The test pistons were machined, fitted to a V8 engine previously rebalanced to accept the lighter forged piston design used, and run intermittently at various power settings. Although the engine was deliberately run abnormally hot, and mostly at full throttle, against a fluid type dynamometer, the pistons showed no sign of wear, change in dimensions or hardness after 50 hours.

The foregoing is an abstract of a paper presented by the author at the Summer Meeting of the Society of Automotive Engineers.

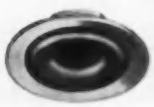
PALNUT® Self-threading Lock Nuts

Make their own threads while tightening

on straight or tapered unthreaded studs, rods, rivets or wire of zinc, aluminum, steel or brass.


Deep, clean threads assure high torque and tensile values.
Hex form fits all standard tools and shanks.
Resilient washer face spans holes and slots.
May be removed and re-used on same studs.
Thread-forming teeth exert powerful vibration-proof grip on studs.
Full contact (360°) on work surfaces, flat or irregular, on perpendicular or off-angle studs.

Other variations available



Washer, with Sealer Keeps out water and dust.

Washer, Grounding Type. Notches cut thru coatings to electrically ground assemblies.

Regular Hex Type Saves space where no flat washer is required.

Washer, Grounding Type with sealer.

WRITE FOR FREE SAMPLES, details, and prices, stating type, size and application.

PALNUT Self-threading Lock Nuts are low-priced spring-tempered steel fasteners with a special thread-forming, thread-locking design.

Save the cost of threading die-cast studs; also rods and wire, by using low-cost unthreaded parts and fastening with PALNUT Self-threading Lock Nuts. Assembly is easy and fast, using standard tools . . . extra fast using PALNUT magnetized wrenches.

PALNUT Self-threading Nuts are used to replace costlier threaded fasteners. Also to replace push-on devices where higher-strength holding is required and to permit removal without danger of stud breakage. Sizes for 1/8", 3/16" and 1/4" dia. studs and rods.

THE PALNUT COMPANY
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AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

For buy appeal, lasting eye appeal... more Nickel plating under new car chrome

Tough, durable Nickel plating underneath new car chrome assures lasting beauty.

That's because good heavy Nickel plating does three things:

(1) It makes a smooth, white-metal foundation for a brilliant chrome finish.

(2) It protects the steel and other base metals from rust and corrosion.

(3) It backs up the chrome surface and keeps it from cracking under impact.

Those are the reasons why your customers can keep their trim showroom-bright, for years and years, with just ordinary washing.

Nickel gives your car trim lasting beauty . . . the lasting eye appeal you need to keep your customers sold!

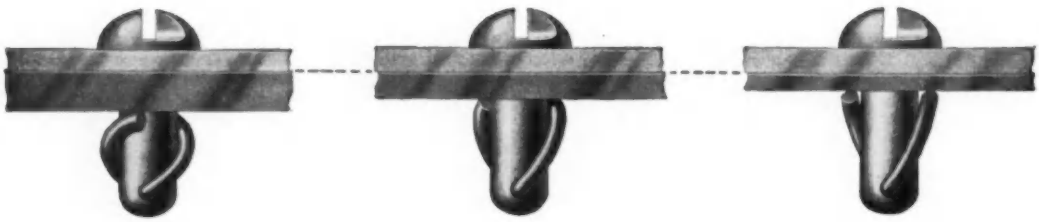
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

Inco Nickel

Makes metals perform better longer

Nickel plating... under chrome ...over steel: That's how a good bumper finish is built up. Chrome gives you shining beauty. Nickel plating makes the beauty last. Steel is for strength and safety.

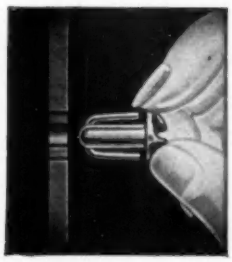
This fastener works through thick and thin!



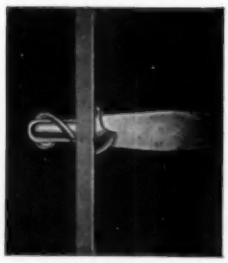
Spring-Lock—the easy-to-use removable fastener for modern designs—works whether panel thicknesses run over or under specifications! Spring wire deflects automatically to handle greater or lesser thicknesses. Spring-Lock's design flexibility makes it more than a fastener: it can be adapted as a shelf support, door strike, knob or any similar panel-mounted device. Many standard shapes and sizes of Simmons Spring-Locks are available from stock.

SEND TODAY for your copy of the NEW 40-page Simmons Catalog. Complete information, engineering drawings, and application data on Spring-Lock and other Simmons Fasteners. Engineering service is available. Samples on request.

HERE'S HOW SPRING-LOCK WORKS



1. *Insert fastener.*



2. *Half-turn locks it in place.*

With production costs on the uptrend, you can figure on Spring-Lock as an assembly time and money-saver, because:

- **Installation is BLIND**
- **Installation is EASY: no special tools are needed**
- **Installation is QUICK: a half-turn locks it in place**
- **Installation is SECURE: the *spring* steel *locks* the fastener, resists vibration**

SIMMONS FASTENER CORPORATION 1749 North Broadway, Albany 1, New York

QUICK-LOCK • SPRING-LOCK • LINK-LOCK • HINGE-LOCK • ROTO-LOCK • DUAL-LOCK

See our 8-page condensed Catalog in Sweet's Product Design File.

New Corporation to Produce Alumina in French West Africa

A new international firm to develop vast bauxite deposits in French West Africa and produce alumina there was announced by Olin Mathieson Chemical Corp.

The new corporation, known as FRIA Compagnie Internationale pour la Production de l'Alumine, will consist of Olin Mathieson, with 53½ per cent of the stock, and one British, one Swiss, and two French companies.

The FRIA plant is being constructed and will be operated by one of the French companies. It will have an initial capacity of 480,000 tons of alumina per year, but is designed for expansion to 1.2 million tons. Total cost of the entire project is estimated at $135 million, the announcement said.

Canadian Car Production Down In First Six Months of 1958

Canadian automobile production in the first half of 1958 totaled 214,151 passenger cars and trucks, of which 198,510 were for use in Canada and 15,641 for export. This compares with 263,316 passenger cars and trucks in the first half of 1957, with 247,533 for domestic use and 15,783 for export.

A further breakdown of figures for the period shows that 170,428 passenger cars were built for domestic use and 12,085 for export, compared with 207,359 for domestic use and 11,436 for export last year.

Truck production in the first half of the year totaled 28,082 for domestic use and 3,556 for export, compared with 40,174 for Canadian use and 4,347 for export in the like period last year.

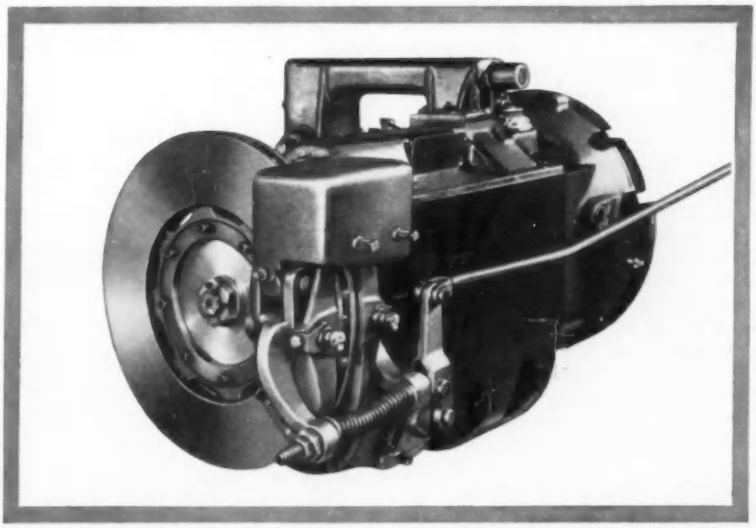
Firestone to Manufacture Fuel System for Marines

Firestone Tire and Rubber Co. will build 13 bulk fuel handling systems for the Marine Corps at its Defense Products Plant in Magnolia, Ark. The 13 units will cost approximately $3 million.

Each system is made up of about 42 collapsible, 10,000-gal, rubberized fabric tanks; 5½ miles of hose; hose connections; separators; and pumps. Each tank weighs about 600 lb—less than one-tenth the weight of a steel tank of the same capacity—and can be folded into a compact package.

Developed by the Marine Corps, the fuel system is an easily transportable "service station" for airplanes and combat vehicles. When in full operation each system will have available 420,000 gal of fuel.

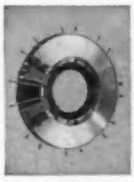
Automotive Equipment is Easier to Sell when equipped with TRU-STOP heavy-duty Brakes



Positive Protection Against Runaway or Parking Accidents

TRU-STOP brakes operate directly on the drive shaft. This means that they are not only excellent parking brakes, but dependable emergency service brakes as well. There's no dangerous self-energizing. TRU-STOP brakes have the surplus capacity for repeated use as an auxiliary to service brakes.

100% Ventilation Minimizes Fading



Brake efficiency depends on ability to dissipate heat rapidly and so prevent fading. TRU-STOP brakes are 100% ventilated. Discs are exposed to air even while braking. The TRU-STOP ventilation system circulates air *between* the disc plates.

Longer Life with Uniform Brake Pressure

The discs of TRU-STOP brakes are squeezed between the flat surfaces of the shoes. The brake lever operates both the front and rear lever arms simultaneously, and pressure is exerted on the center of each shoe. This puts the entire lining surface in contact, provides for even wear. TRU-STOP brake linings are *easy* to replace.

FOR POSITIVE PROTECTION...

Specify* TRU-STOP BRAKES *on* ANY *Heavy-Duty Equipment that Requires Braking

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Automotive and Aircraft Division

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New Developments in Torsion Bars

By R. E. Hanslip and L. O. Imber
THE MATHER SPRING CO.

It might be well at this point to mention some of the advantages of a laminated torsion spring over a conventional round torsion spring. One of the biggest advantages of the laminated torsion spring is the low cost. If standard SAE gages of conventional leaf spring steel are used, there is an immediate cost advantage in the material and it is readily available. It seems trite to cite the advantages of being able to cut flat plates to length and to heat treat for a torsion spring, but where presetting is not required, the manufacturing procedure is little more than this.

The laminated torsion spring, doing the same job as a round torsion spring, will almost invariably be shorter, but this is only an advantage if space is at a premium. In many cases, the length available for the installation of a torsion spring rules out the use of a round bar.

There is a safety advantage as there is in a laminated leaf spring; when one lamination breaks, the vehicle will not be completely disabled. Great care is taken in the production of round torsion bars to preclude the use of material with seams and other surface defects, but with laminated torsion springs, a plate may split lengthwise and the total torque developed by the pack would not be noticeably reduced. If the end of the plates are bent at right angles to form an anchor, then the method of transmitting torque into the plate becomes relatively inexpensive. It is possible to obtain variable rate effects from flat plates in torsion.

One of the disadvantages of a laminated torsion spring is the larger cross sections required by such a spring. Another is the greater weight of the laminated torsion spring when compared to the round torsion spring. The design of such springs is slightly more complicated than that of a round bar.

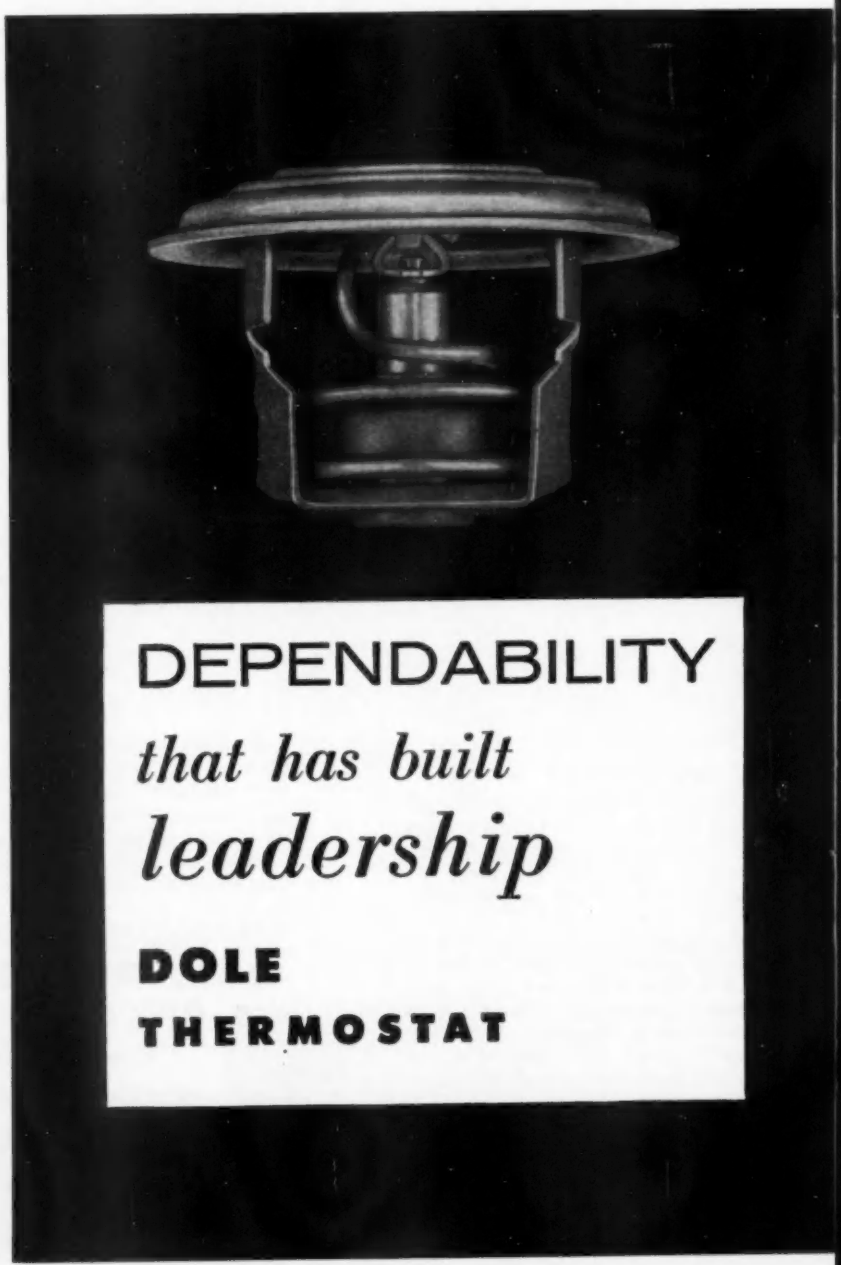
Design Categories

The design of a laminated torsion spring can be roughly divided into two categories: that of narrow plates where the torque due to secondary stresses can be ignored, and that of wide leaves where the secondary stresses contribute substantially to the torque developed by the spring.

In checking numerous widths and gages, it has been found that standard SAE gages 2 in. wide and under have essentially a straight line torque-deflection curve, and will be considered as narrow plates. Those leaves with a width of 2½ in. and over would be classified as wide plates.

It would be desirable at this point to state just exactly to what metal-to-metal stresses, static stresses, and stress ranges laminated torsion springs could be subjected; but it would be unfair to expect the spring manufacturers to describe exactly the stress limitation of his spring without knowing the details of the application.

The stresses in the laminated torsion bar on the Volkswagen, which are not preset, are approximately 75,000 psi static, and this suspension has proven to be very satisfactory. It is recommended by some that the maximum shear stress of laminated springs be in the same neighborhood as round torsion bars, or in other words, about 130,000 psi for passen-



ger vehicle. Fatigue tests on the aforementioned boat trailer spring assembly have shown good life, operating from 75,000 to 125,000 psi without presetting or shot peening, although some settling was experienced. The maximum stresses to which laminated torsion springs could be subjected would depend on whether the bars were preset, and whether there had been any surface preparation, such as shot, or roll peening.

It will be remembered that in presetting flat bars, they were twisted to a strain of .022 and on unloading they recovered approximately .015. In other words, after presetting they could be twisted to a strain of .015, and if we are talking about a narrow bar, the torque-deflection curve would be a straight line. This .015 strain represents a stress of about 170,000 psi. This should not be construed to mean that flat plates in torsion could be operated at stresses anywhere near this figure.

Type of Socket

The allowable design stresses would also be a function of the type of socket used at each end. For instance, if the bars were merely put into a rectangular hole, through which the torque is transmitted, the stresses should be lower than if a socket were used which tended to eliminate localized stresses. Since the torque is transmitted from the socket through the outside plates of a laminated torsion spring, fatigue failures will occur in the outside plates. It might be well to reduce the thickness of these plates so that the addition of any localized socket stresses to the torsional shear stress would not add up to the failure in the bars.

Experience has shown that the torque developed by laminated torsion springs is substantially that of a single bar of the same width and gage being used in the pack multiplied by the number of bars in the pack. While it seems logical that the outside bars of the pack should develop more tension than the bars on the inside of the pack, such is apparently not the case.

Because narrow plates do not exhibit a noticeable secondary torque effect, it will make little difference to the torsional rate of the spring, whether the plates are preset away from the flat state, or from a pretwisted condition towards the flat.

The foregoing is an abstract of a paper presented by the authors at the Summer Meeting of the Society of Automotive Engineers.

Solar Aircraft Demonstrates New Gas-Turbine-Powered Boat

Solar Aircraft Co. is demonstrating a new gas turbine powered, 55-ft crew boat that it says can attain cruising speeds of 35 mph.

The boat, built by Sewart Seacraft, Berwick, La., is powered by two Solar Jupiter 500-hp gas turbines, which have a combined weight of 4400 lb, or about one-sixth the weight of Diesels of equivalent power.

The boat, which was designed for offshore oil operations but can easily be converted to an executive offshore cruiser, has no engine vibration, because of the rotating operation of the gas turbines. The gas turbines operate on Diesel fuel, but can be simply adjusted to use other fuels, including gasoline, jet fuel, kerosene, and natural gas.

Here are the facts about Dole leadership

In 1952 Dole introduced the first satisfactory solid expansion type thermostat engineered especially for post-war engines.

In 1954 — only two years later, the unit was generally accepted by the Automotive Industry.

Today — 1958, Dole Thermostats are standard equipment on seventeen (17) out of eighteen (18) top passenger cars*; also most trucks, commercial vehicles, tractors, and industrial and marine engines.

There's one outstanding reason for this tremendous acceptance . . .

Dependability!

And that applies equally to the product and the company that manufactures it.

* as listed in Automotive News.

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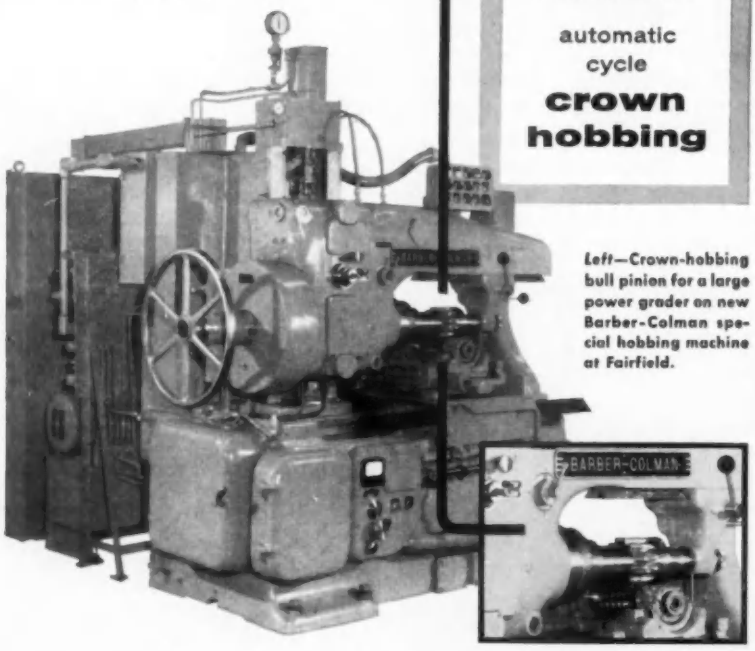

Left—Crown-hobbing bull pinion for a large power grader on new Barber-Colman special hobbing machine at Fairfield.

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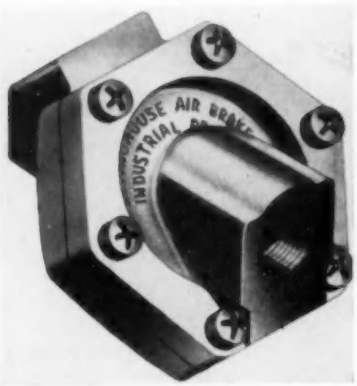
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

NEW PRODUCTS

(*Continued from page* 86)

Quick Release Valve

The Westinghouse quick release valve is designed for efficient air-pressure venting of cylinders and other pneumatic devices. Pressure can be vented in small increments (approximately 6 psi) due to the valve's sensitivity. It is made of aluminum and weighs seven ounces. It



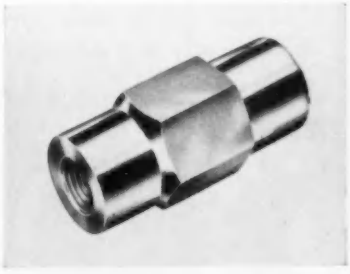
may be mounted on a rotating or revolving device and the centrifugal force will not impair its operation. *Westinghouse Air Brake Co.*

Circle 74 on postcard for more data

Air Bleed-Off Valve

This Air bleed-off valve automatically eliminates air in hydraulic circuits and operates in hydraulic circuits under pressures up to 5000 psi.

The valve remains open, as long as the system pressures remain low,



and permits air to flow to the tank. When air has been dissipated, the initial surge of hydraulic fluid automatically closes the valve, which remains closed until the pressure drops. *Denison Engineering Div., American Brake Shoe Co.*

Circle 75 on postcard for more data

(*Turn to page* 116, *please*)

How BCA Specialization pays off for Original Equipment Manufacturers

Improved product performance and real production economies are assured when you count on BCA for ball bearings. BCA specializes in ball bearings for automotive applications—cars, trucks, buses, off-the-highway equipment . . . farm implements. This experience plus our manufacturing flexibility can serve you well. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

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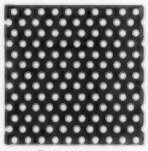
H&K PERFORATED MATERIALS

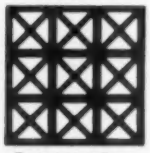
for Industrial or Decorative Uses

THOUSANDS OF DIFFERENT PATTERNS AVAILABLE



Round holes

Oblong holes

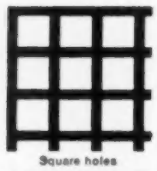


Decorative patterns

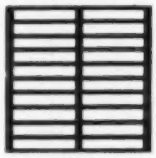
H & K facilities enable the perforating of all metals, wood, plastics and cloth fabrics. Perforated materials can be furnished in sheets, coils, rolls or plates. Fabricating services include shearing, rolling, welding and forming.

Perforated metal can be ordered with special finishes: aluminum—color anodized or brushed and lacquer finish; steel—painted, chrome plated, enameled, japanned or other baked-on finish. Decorative patterns can be embossed if requested.

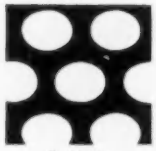
Many patterns in steel sheets (industrial or decorative) are in stock at our warehouses. Send for H & K Stock List Brochure.



Square holes



Slots



Oval holes

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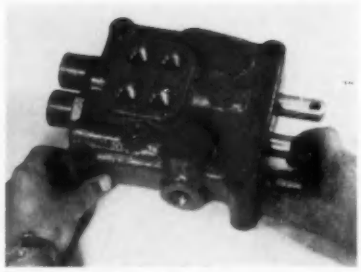
NEW PRODUCTS

(*Continued from page* 114)

Directional Valves

Nominal ratings from 5 to 25 gpm and up to 6-spool configuration are offered in a line of hydraulic directional control valves made to meet



the requirements of earth moving, material handling and industrial equipment.

The valves are designed for operating pressures up to 2000 psi and actuation is through a lever control. *Wooster Div., Borg-Warner Corp.*

Circle T6 on postcard for more data

(*Turn to page* 122, *please*)

SERVICE!

Lincoln is not content merely to produce molded thermoplastic parts to your specifications. Lincoln service extends from your engineering department to your production line . . . from helping you design the part that will do the job best for the least money to helping you install the best procedures for assembly of that part.

For details on Lincoln's "complete" plastic parts service, just drop us a line. Be sure to ask for your free copy of "Development and Progress," a 12-page bulletin describing Lincoln's complete, modern facilities for producing . . . on any reasonable delivery schedule . . . anything you need in injection molded plastics.

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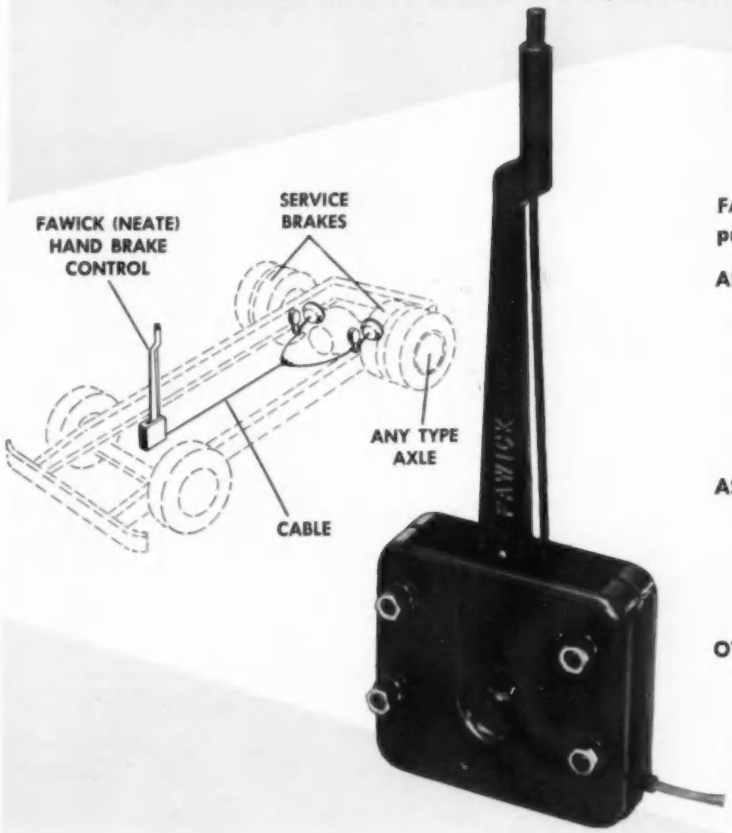
Safe emergency stops plus positive parking brakes . . . with

FAWICK (NEATE) HAND BRAKE CONTROL



FAWICK (Neate) Hand Brake Control provides unmatched advantages:

AS AN EMERGENCY BRAKE

- positive, driver-controlled brake application.
- up to 12" cable take-up thru multi-stroke operation.
- equal brake loading without adjustment — self-compensating for uneven brake wear.
- standard 10-to-1 mechanical advantage; other ratios available.

AS A PARKING BRAKE

- instantaneous or gradual release.
- no drive shaft vibration or unbalance from parking brakes.
- simple design — eases drive shaft angularity problems on short wheel-base vehicles.

OTHER FEATURES

- easy to install.
- easy to service.
- adaptable to any type of axle including tandem axles.

New patented multi-stroke unit permits mechanical application of service brakes

Now you can use the wheel brakes on the axle for emergency and parking! No longer need you depend on a drive shaft brake for this critical part of your braking requirement.

The FAWICK (Neate) Hand Brake Control enables your driver to apply *service brakes* mechanically for (1) emergency when air fails and (2) parking. This is accomplished with one lever assembly and direct cable connection to brake cam shaft slack adjuster levers. The result — no more braking done through differential and drive shaft, no more costly repairs after an emergency stop.

The FAWICK (Neate) Hand Brake Control is ready for your use — to help improve the safety and economy of your vehicles. Contact FAWICK Brake Division for further information.

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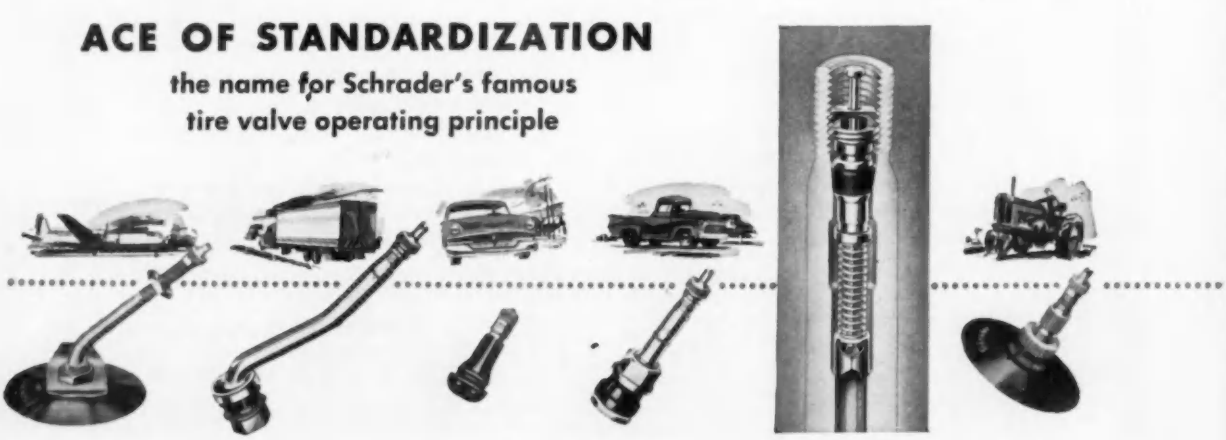
the name for Schrader's famous tire valve operating principle



CAN AIR-SERVICE TODAY'S TIRES

years of tire valve standardization make it easy

On the other side of the world, servicemen are using the same American tools, parts and methods to service vehicles as the man in the station down the block. Tire service is fast and easy because of standardization, but this situation didn't just happen. The U. S. Automotive, Tire and Tire Valve Industries combined their skills and experience not only to maintain highest quality while mass producing at lowest cost, but to produce interchangeable air valves and tools that make service possible anywhere a vehicle goes. Schrader's job is to utilize all the Industry know-how and produce the safest, most practical and dependable valves for all types of pneumatic tires.

Count on quality Schrader Tire Valves to match the performance of your vehicles . . . because the "Ace of Standardization" design can be serviced anywhere in the world.

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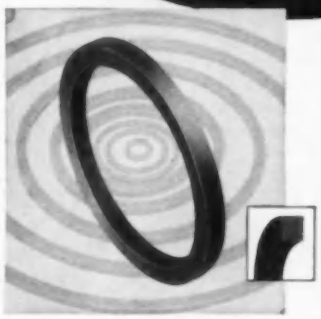
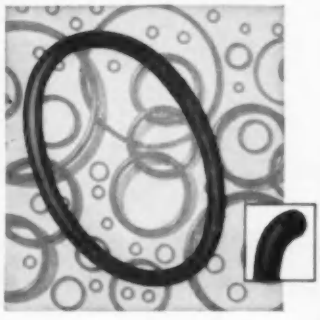


TETRASEALS

save money with seals of rectangular section design.

Precision-cut to extremely fine tolerances, TETRASEALS provide the answer to better dynamic sealing at lower cost. Resulting from precision fabricating methods developed exclusively by Goshen, TETRASEALS not only are equal in quality to standard O-rings, but are interchangeable with them . . . use the same groove.



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Now, dimensions and tolerances of AN, MS, SAE, JIC and NAS are met consistently with standard tooling from compounds useful over a temperature range of —80° F to +500° F. Non-toxic, too. Lower unit costs, fewer rejects, faster delivery, are other advantages.

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☐ O-RINGS ☐ GROMMETS

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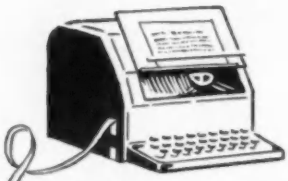


ON OUR WASHINGTON WIRE

Labor leaders are alarmed over management's recent political awakening. One AFL-CIO official charges that General Electric has "joined hands with other big companies" in urging a state right-to-work law. Pres. William Allen of Boeing Airplane Co. is also charged with advising his supervisory employes to sign petitions asking for a right-to-work law and has asked each to get at least 100 additional signatures on the petitions.

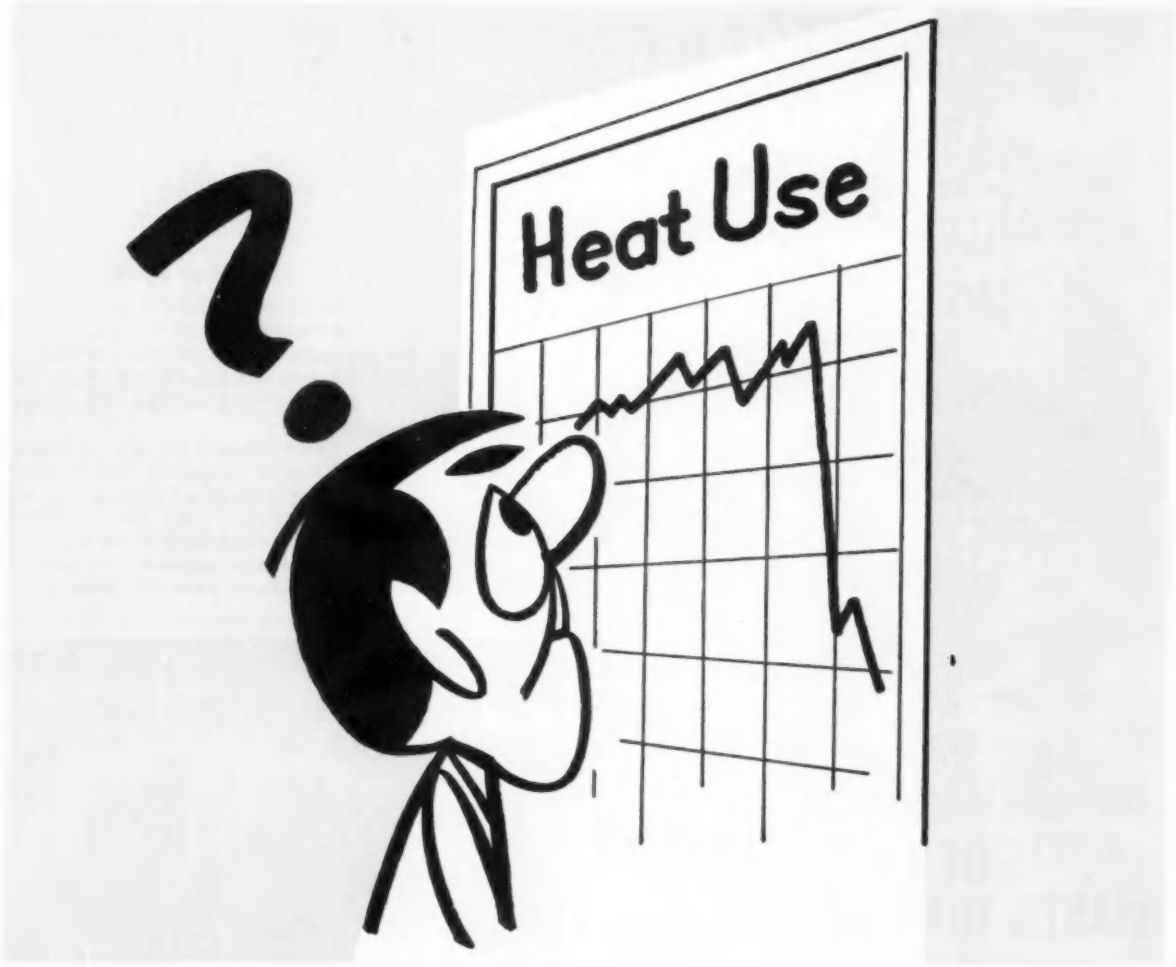
This growing concern of union leaders demonstrates that management is making headway in its new drive for political action. It also shows that management must be prepared to have some bricks hurled in its direction. But this only proves that the stakes are worth fighting for.

The U. S. Dept. of Commerce has undertaken an item-by-item review of the several hundred commodities and products which have been barred from shipment to Red countries and may now be exported under the liberalized control rules agreed to recently by the U. S. and other Free World nations.

But it's a slow process. Commerce believes that October 15 is the earliest date by which it can possibly have a complete list ready, and actual date of publication of the list may be closer to November 1. Meanwhile, the department advises exporters to file their applications for export licenses in order to obtain advice as to whether or not any particular item will be licensed for export under the new policy.

Nuclear-powered ships will soon open new markets for metals and other products. The world's first nuclear merchant ship will be launched in the U. S. next year and be in regular service by 1960. The $20.9 million cargo-passenger ship may be able to cruise 500,000 miles without refueling.

Sweeping new tax laws passed by Congress this year will mean tax savings of up to $400 million a year for businessmen—if they use them. Among the savings: A special 20 per cent depreciation in the first year on new equipment; higher earnings accumulation; longer loss carryback to gain tax refunds; deduction for losses sustained by small business investors; easier inheritance tax payment rules; more realistic tax treatment on contract renegotiation, foreign tax credits, and anti-trust damage awards.



THE CASE OF THE PUZZLED ENGINEER

(A Cold Bonderite* Story)

The plant heating engineer, wondering at the diminished demand on his heating plant, set out through the plant to find the cause. All was normal until he met the finishing superintendent. "Haven't you heard?" asked that happy gentleman. "We've installed Cold Bonderite* in our finishing line. Steam use is down 90% and water use is down 50%!"

*"Cold Bonderite" is the commonly used term for a phosphate coating system developed by and exclusive with Parker Rust Proof Company. Its use is saving many manufacturers thousands of dollars a month.

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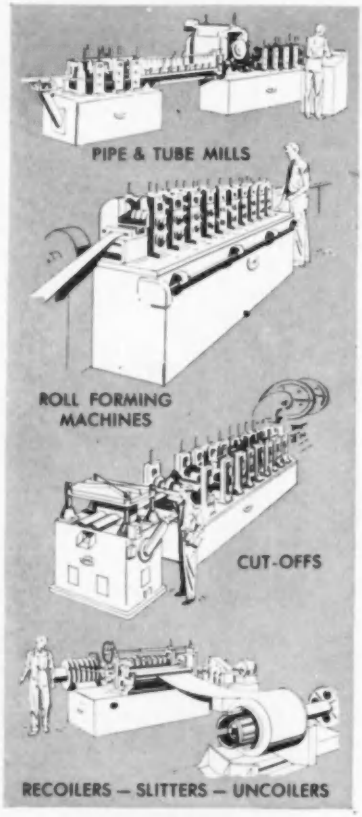

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(ferrous or non-ferrous)

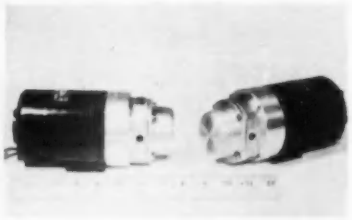
NEW PRODUCTS

(*Continued from page* 116)

Pump-Motor Combination

The Powermite Model AKX is a pump and motor combination designed to operate from a conventional 12 v battery. The unit was developed for hydraulic applications on small mobile hoists.

Measuring 3 3/16 by 7 5/16 in. it is rated for 30 cu-in. per minute at 500 psi. Motor rating is ⅛ hp. Operating temperatures can be up to 200 F. *Tuthill Pump Co.*



Circle 77 on postcard for more data

Casting Resins

A line of casting resins which meet the requirements of most casting, encapsulating and potting applications has been developed by the Adhesives Department of Raybestos-Manhattan, Inc.

The compounds are used to confine the flow of current in electrical and electronic circuits to a prescribed path and to protect and immobilize electrical and electronic parts.

Circle 78 on postcard for more data

(*Turn to page* 126, *please*)

AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries

Quantity PRODUCTION *of* GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866
THE WHELAND COMPANY
FOUNDRY DIVISION
MAIN OFFICE AND MANUFACTURING PLANTS
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wire rope assemblies

Every Type—Any Quantity
Custom Engineering Service

BERGEN WIRE ROPE CO.
51 Gregg St.
Lodi, N. J. (Hu 7-3510)

NEW FROM DU PONT RESEARCH

Remarkable resistance to ozone, aromatic fuels, and "sour gas" shown by new **FAIRPRENE**® diaphragm material

Now, Du Pont announces the development of a new "Fairprene"† coated fabric for diaphragms. This new material shows remarkable resistance to swelling and deterioration in aromatic fuels, "sour gas" and under high ozone conditions—retains its properties from -65°F.

For further information about these "Fairprene" ozone and aromatic fuel resistant diaphragm materials mail the coupon below or write: *E. I. du Pont de Nemours & Co. (Inc.), Fabrics Division, Dept. AI-89, Wilmington 98, Delaware.*

CONSTRUCTIONAL AND PHYSICAL PROPERTIES††

Quality No.	22-005FO	21-009FO	22-006FO
FABRIC BASE	NYLON	COTTON	NYLON
Thickness	.013"	.013"	.050"
Tensile Strength—Lbs./Inch, Min.	75 x 75	80 x 80	300+ x 300+
Tear Strength—Lbs., Trap., Min.	2 x 2	2 x 2	25 x 25
Burst Strength—PSI, Mullens, Min.	125	125	500
Ozone Resistance at 60 Parts Per Million*	OK 208 Hr.	OK 208 Hr.	OK 208 Hr.
Fuel Resistance—Volume Change after 72 Hrs. at Room Temp. in ASTM High Aromatic Fuel**	+3.3%	+9.4%	+20.9%

*Ordinary diaphragm materials fail in 15 minutes under this test.
**Ordinary diaphragm materials swell about 20% under the same conditions.
††The above data are based upon tests on production experience and should not be used as specifications.

†*"Fairprene" is Du Pont's registered trademark for its coated fabrics, sheet stocks and cements.*

DU PONT
INDUSTRIAL COATED FABRICS
SHEET STOCKS · CEMENTS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

▶ Mail coupon for free sample of new "Fairprene" ozone and aromatic fuel-resistant diaphragm material . . .

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division, Dept. AI-89, Wilmington 98, Delaware

☐ Please send free sample of new "Fairprene" diaphragm material with high ozone and aromatic-fuel resistance.

☐ Please send bulletin on "Fairprene" industrial coated fabrics.

Name_____ Position_____

Company_____

Address_____

City_____ Zone____ State_____

MEASURING UNIT

A. A thermocouple signal to a d'Arsonval galvanometer, the only moving part, moves the indicating pointer up scale.

B. Aluminum vane adjusts the amount of light received by the photocell from the operating lamp.

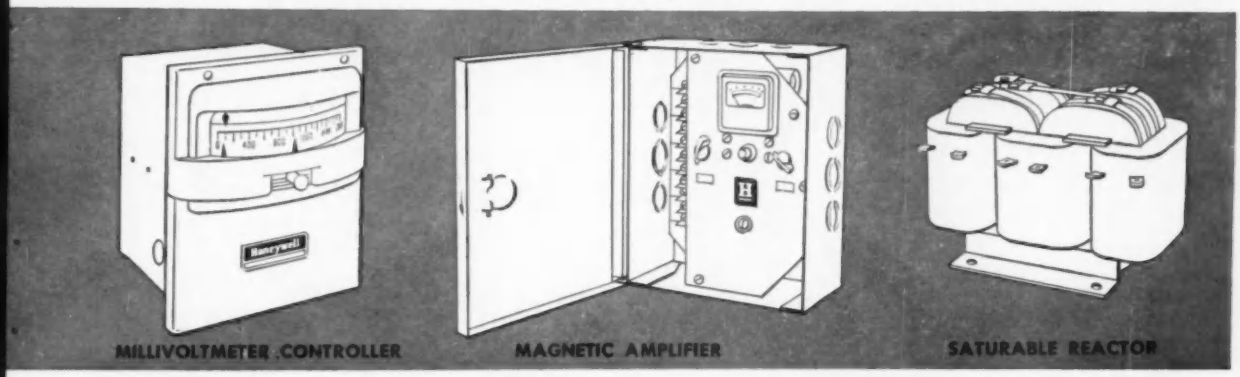
C. If operating lamp or photocell fails, output voltage assumes a value equal to high temperature.

CONTROL UNIT

D. A one-stage magnetic amplifier amplifies small current from the photocell in the measuring unit. This is the only active electronic element in the controller.

E. Pilot light goes out on line power failure.

Pyr-O-Volt **controller is dependable and trouble-free. Built-in voltage regulator maintains voltage within ±1% of level required for maximum operating stability. Thermocouple burnout protection is optional. Spare operating lamp is supplied with all instruments. Available in both horizontal and vertical case models.**



For your electric heating applications...

Use this dependable, low-cost *Pyr-O-Volt** controller

- **No tubes to wear out**
- **Voltage regulation**
- **Fail-safe design**
- **Contactless, stepless control**

Here's a low-cost instrument for reliable stepless control of saturable reactors, r.f. generators and other power amplifiers. It has a proportional band adjustable from ⅔% to 5%, and a manual reset adjustment which shifts the control point over 100% of the proportional band.

You can use this proportional output millivoltmeter-controller with the General Electric *Reactrol***, and the Westinghouse *Furnatron*.*** Combined with a Brown magnetic amplifier, it can control saturable core reactors up to 100 kva. Complete packaged systems available.

Contact your nearby Honeywell field engineer for complete details. He's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

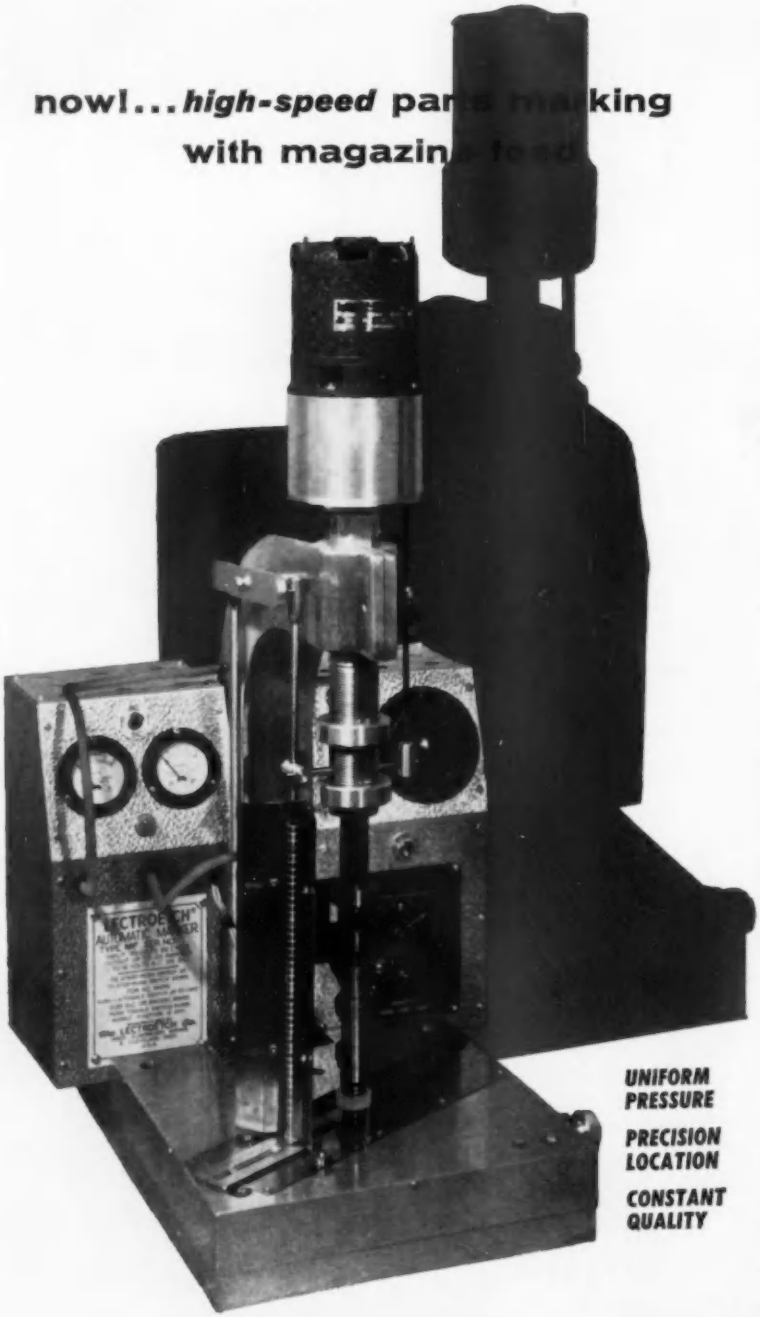
Honeywell

H HONEYWELL *First in Control*

● **REFERENCE DATA: Specification S103-5**

*Tradename, Minneapolis-Honeywell Regulator Co.
**Tradename, General Electric Co.
***Tradename, Westinghouse Electric Corp.

now!... *high-speed* parts marking
with magazine feed



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LECTROETCH

automatic markers

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for trade marks — parts numbers — MIL Nos.

Lectroetch electrolytic stencil-etch marking can be applied to your needs for high-speed accurate metal marking . . . thanks to the new automatic instrument above. Lectroetch marks any commercial metal without stress or distortion . . . and its low cost will surprise you! Want details? Write today!

The **LECTROETCH®** *Co.*

14925 Elderwood Avenue — East Cleveland 12, Ohio

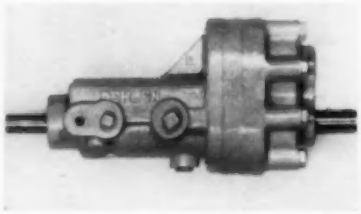
NEW PRODUCTS

(*Continued from page* 122)

Servo Mechanism

This servo mechanism has been designed for use on many types of heavy construction and agricultural vehicles. It can be used as a power steering device or wherever a rotary servo motion is required. The power source in the unit is a gear motor that will rotate any number of turns under full power in either direction.

A spool valve assembly acts as both the mechanical and hydraulic coupling between the input and output shafts. Hydraulic fluid is diverted to either side of the gear motor as the spool valve shifts laterally under the control of the spool sleeve cam slots. Although the flow is continuous in the



system, it is not pressurized until at least one pound of force is exerted at the steering wheel. The manual steering effort becomes the signal source for the working force. *Behlen Mfg. Co.*

Circle 79 on postcard for more data

Film Resistor

Designated C-42, a two-watt film resistor displays high stability under humidity and changes in voltage and temperature.

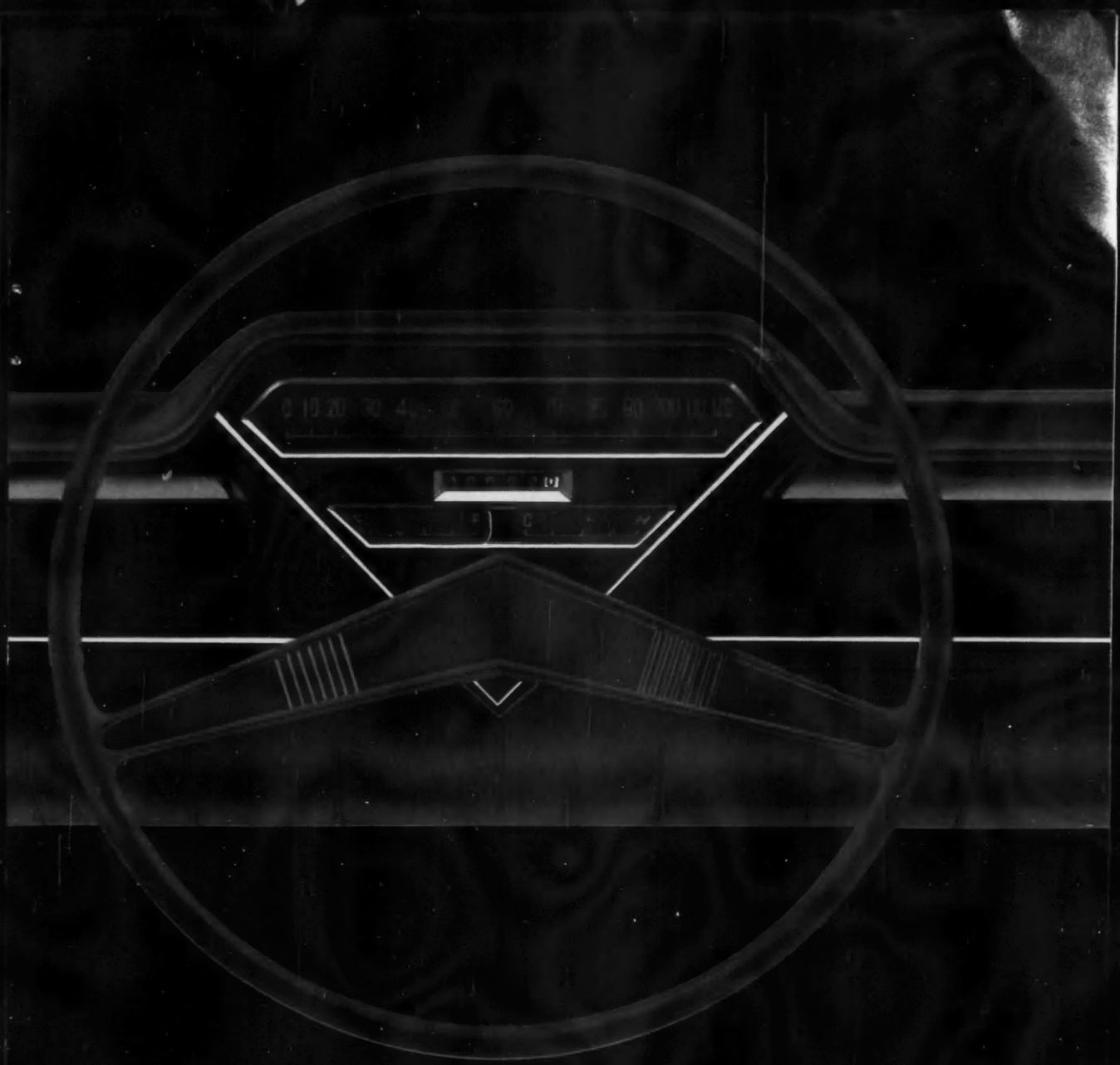
Designed for industrial and military applications at temperatures up to 150 C, the resistor has a resistance of 200 ohms to 1.5 megohms. It is capable of withstanding momentary overloads up to 250 times its rated power of 2 watts at 70 C.

Available in five and ten per cent tolerances, it has an OD of 0.318 in. and is 11/16 in. long. *Corning Glass Works.*

Circle 80 on postcard for more data

AUTOMOTIVE INDUSTRIES

Keeps You Informed



Aluminum Interior Trim

adds colorful, lasting,
sales-appealing beauty
in fine new cars

The Finest Products
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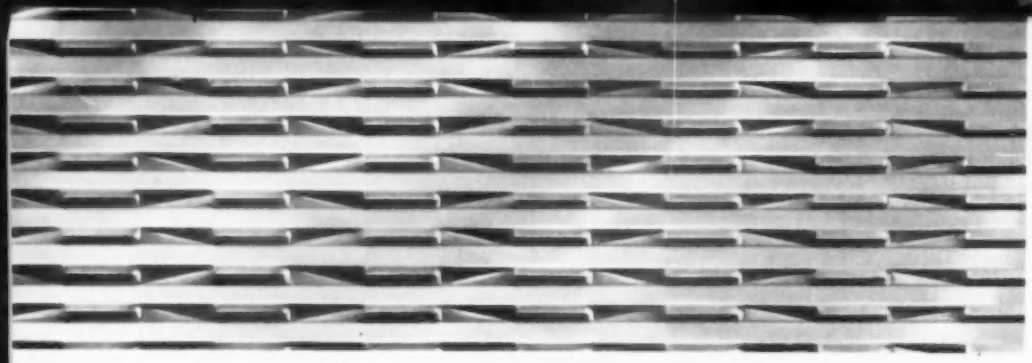
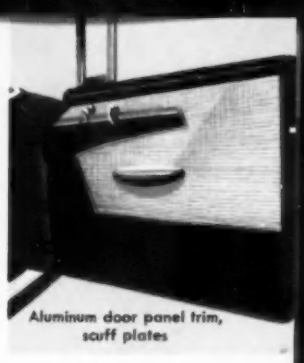
are made with
REYNOLDS ALUMINUM

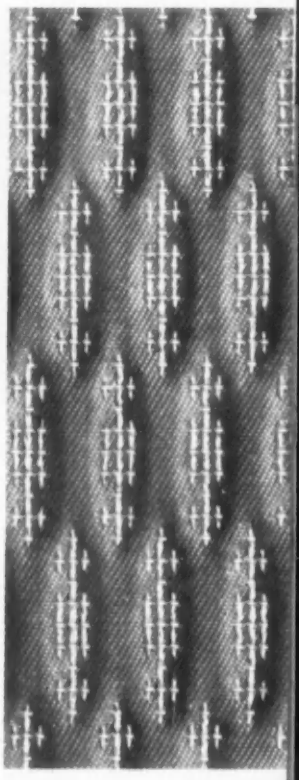
TURN PAGE FOR INTERIOR TRIM INFORMATION.....

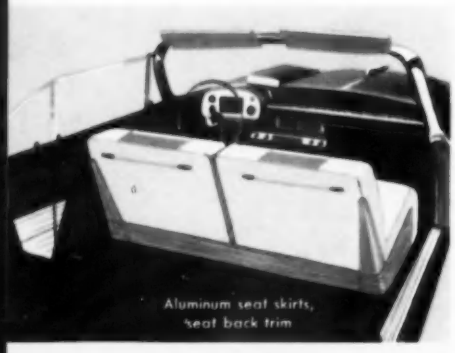




Aluminum door panel trim, scuff plates

New Aluminum textures and finishes offer important sales and manufacturing advantages





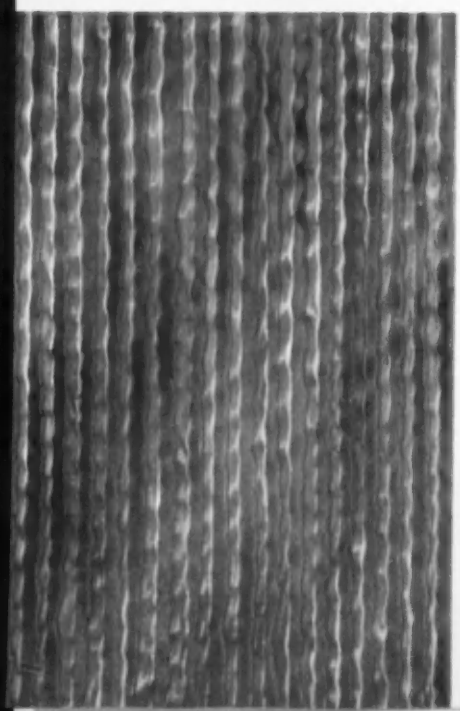
Aluminum seat skirts, seat back trim

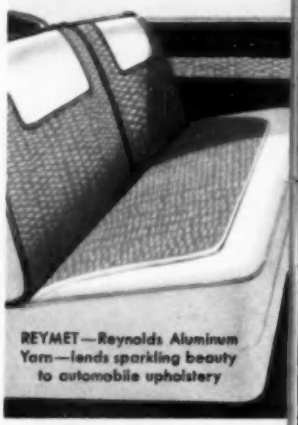
Reynolds Aluminum "gleam of gold" and "look of sterling" are currently adding lasting, sales-appealing beauty in both interior and exterior applications. Now—for still broader interior use in instrument panels, seat skirts and many trim parts—a variety of attractive new textures and finishes are intriguing automobile manufacturers. In addition to clear and color anodized combinations, contrasting colors can also be added through the use of organic finishes.

These aluminum parts will not rust, chip, pit, peel or flake. They create customer appeal . . . assure lasting beauty . . . increase design freedom . . . offer a "new look" at modest cost . . . permit manufacturing economies.

On trim applications and on countless other decorative or functional applications, Reynolds Aluminum Specialists will be glad to work with you to help you get the very most from the aluminum you use. For details on this service and on aluminum mill products or fabricated aluminum parts and trim, call your nearest Reynolds Office. Or write *Reynolds Metals Company, Fisher Building, Detroit 2, Michigan or P.O. Box 2346-MU, Richmond 18, Virginia.*

NOTE: Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower *final* cost.





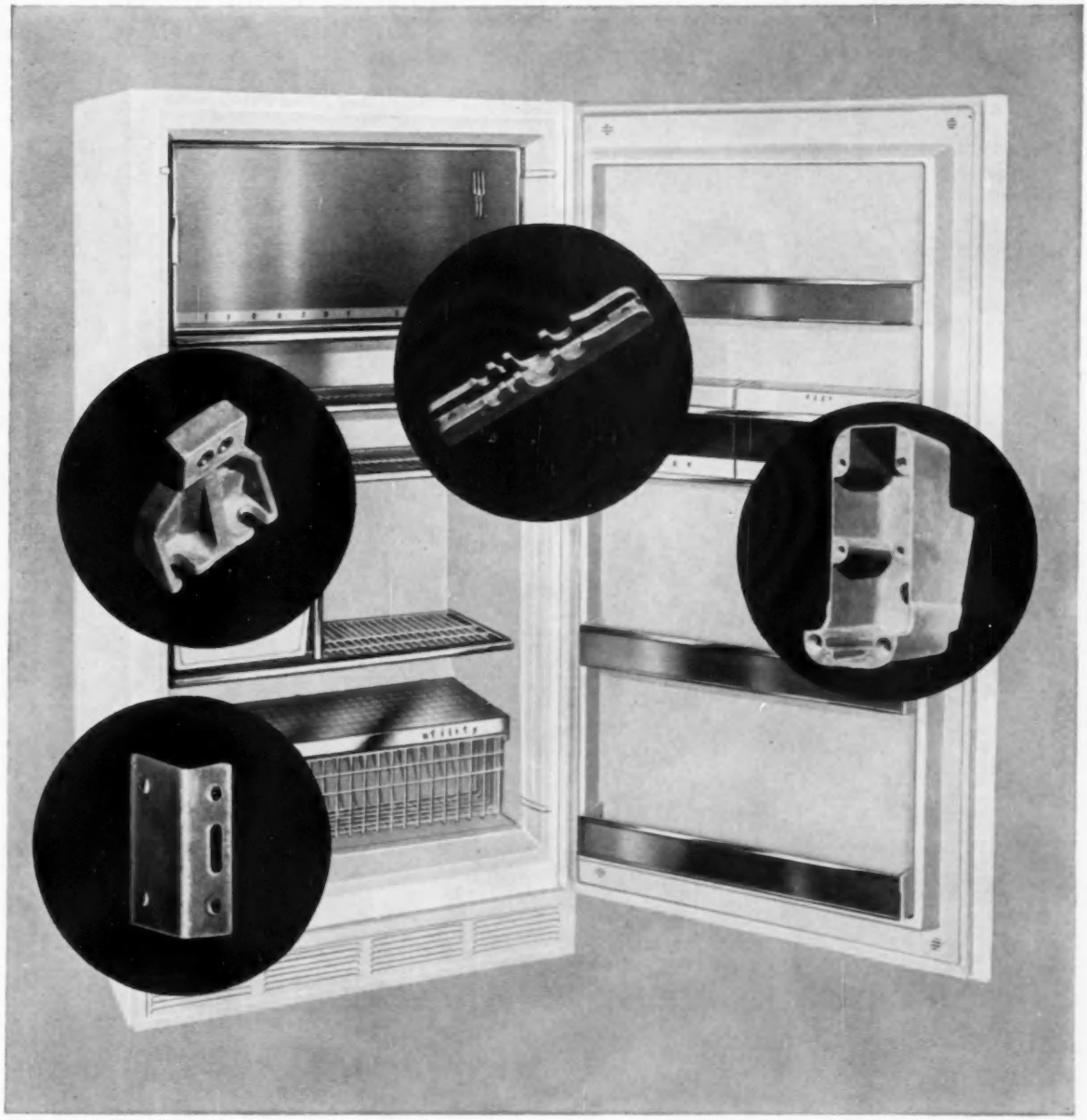
REYMET—Reynolds Aluminum Yarn—lends sparkling beauty to automobile upholstery

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Reynolds Aluminum

the metal for *automation*

TRADE MARK



Kelvinator gets big benefits from premix moldings

Premix moldings are making an important contribution to performance of Kelvinator refrigerators.

Strike mounting plates, tie-straps, tubing retainers and lock housings for the Kelvinator are all premix moldings. They've proved tough and resilient . . . excellent shock absorbers. And their thermal insulating properties contribute to the economical operation of the refrigerator.

When resins and reinforcing fibers are blended beforehand, moldings are stronger, wall thicknesses more uniform, weak spots are eliminated. Small and large, simple and complex, premix moldings are not only improving products but cutting costs for hundreds of manufacturers.

If your product calls for strong, rigid, reinforced plastics, look into premix moldings made with Dow vinyltoluene or Dow styrene. Get the names of molders and suppliers from your nearest Dow sales office or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Dept 2207H.

YOU CAN DEPEND ON DOW

Experience**—the added alloy in **A-L Stainless, Electrical and Tool Steels

Allegheny Ludlum knows more about stainless than anybody . . . and puts it in print for you

Allegheny Ludlum *should* know more about stainless than anybody: they've been the leading producer of all forms for more than 40 years. And the industry's only that old.

Today, A-L produces more different sizes, shapes, finishes and alloys of stainless than any other company. Backing up its quality products are research and development facilities with people second to none.

With know-how and experience gained over the years, Allegheny Ludlum keeps little of it secret: it offers the most complete selection of literature available anywhere.

Literature, designed to help you learn more about Allegheny Stainless and how it can improve your product, is just one help offered by Allegheny Ludlum. You also get the best assistance from trained salesmen and technicians, ready to help you on your specific problem.

All this service is available through your Allegheny sales engineer. Call him today. Or, as a starter, write for the publication list describing the over 150 technical pieces made to assist you.

Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa. Address: Dept. AI-9.

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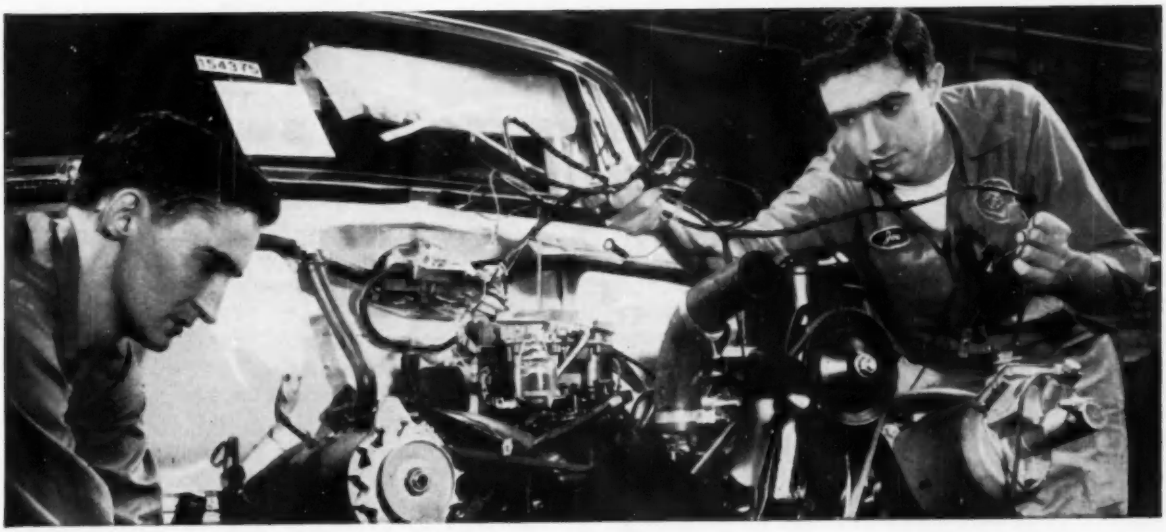
EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT

FACT / *The extra care Packard takes here!*



RESULTS / *In extra savings for you here!*

When you snap on a Packard Electric wiring harness, you know *it's right!* Packard Electric harness designers have worked closely with you and your component-part suppliers, so when the assembly line is reached, everything keeps going like clockwork.

Another thing about Packard Electric wiring harnesses: All the parts are made and assembled at Packard. This provides a quality control that is unique in the cable industry, and results in saving you money, time and trouble. What's more, every tenth Packard Electric employee is a fully trained inspector who uses the latest testing mechanisms, plus his own experience, to give you perfection in every unit.

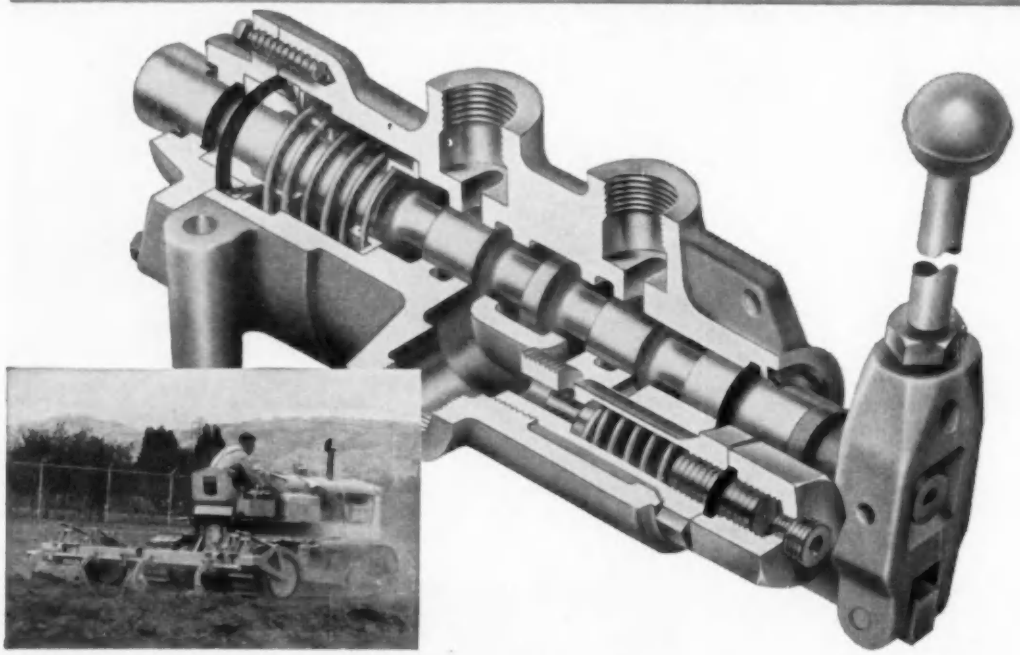
If you are not already using Packard harnesses, as many automotive manufacturers do, it will pay you to start doing so soon. Packard Electric maintains offices in Detroit, Chicago and Oakland, California, for your convenience.

Packard Electric

Warren, Ohio

"Live Wire" division of General Motors

NATIONAL OIL SEAL LOGBOOK



Use of O-rings as moving seal in heavy duty bulldozer control valve

1,500 psi variation without backup rings. Intermittent operation plus long periods of inactivity. Extreme external dust and dirt conditions. Irregular and unpredictable field servicing. Fluid oil temperatures reaching 180°F. Climatic temperature extremes from —30° to +120°F. Life expectancy is required to be that of the tractor.

Above are the rugged operating conditions faced and met by National industrial O-rings in the new Be-Ge Model SU-1200F bulldozer blade control valve. A total of four rings are employed in each unit; two in a moving shaft application and two as static seals.

Be-Ge reports no leakage or ring failure on hundreds of heavy duty applications involving Oliver, Caterpillar, International Harvester and other crawler tractor installations.

National offers a complete line of industrial O-rings, plus many exclusive compounds. Special compounding is also available to meet unusual conditions.

For complete information on National O-Rings, or for skilled O-ring engineering service, call your nearest National Seal engineer. In major cities nationwide. See the Yellow Pages, under "Oil Seals".

Syntech® Oil Seals

Syntech oil seals, developed by and offered exclusively by National, are widely used synthetic rubber seals for applications where temperatures reach 250°F, speeds reach 3,600 FPM, and total indicator runout is as high as .030. Basic 50,000 series Syntech (illustrated) employs a tough, accurately manufactured steel outer case, precision-tensioned spring and accurately molded and trimmed Syntech sealing lip.

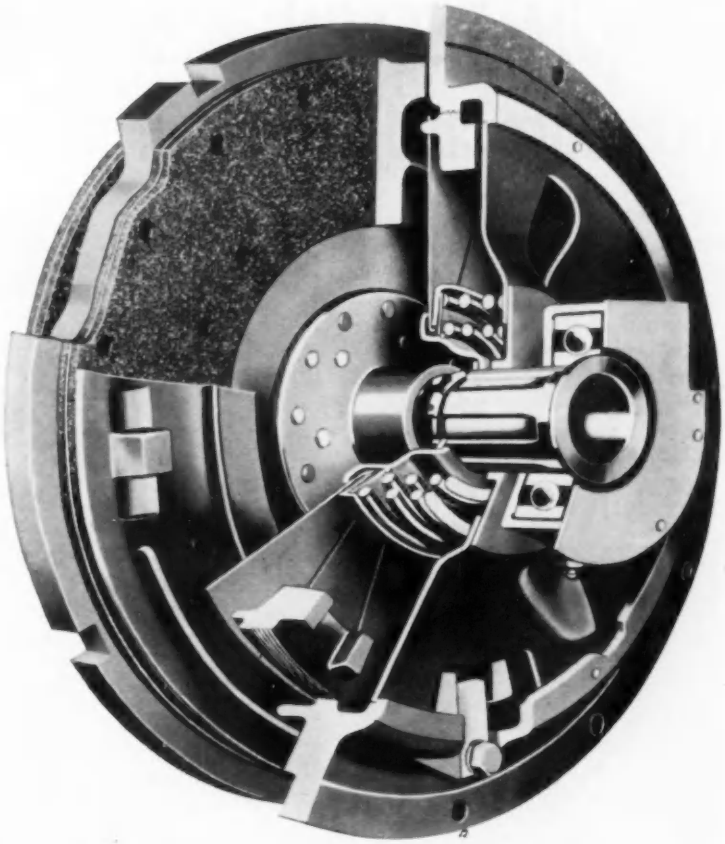
Micro-Torc Oil Seals

Micro-torc oil seals, pioneered by National, are sturdy, dependable leather seals. Special elastomer coating on *surface* of chrome re-tanned leather sealing lip prevents seepage of oil. Yet inner body of sealing lip retains natural porosity to "store" lubricant against accidental periods of starvation. Inherent lubricity of elastomer coating produces a lower torque, longer lasting, economical oil seal. Available in a wide variety of types and sizes.

NATIONAL SEAL
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Van Wert, Ohio, Redwood City and Downey, California

Check these features of Spicer CLUTCHES

For Automotive, Agricultural, and Industrial use



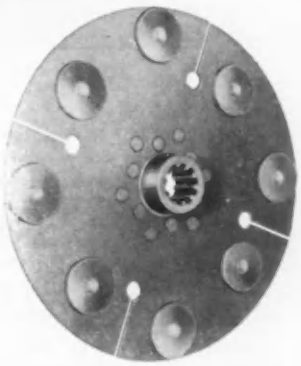
UNITIZED ASSEMBLY . . . Spicer Clutches are delivered ready for hook-up to the pedal linkage, complete with bearing, bearing housing and guide. No further engineering or purchasing of additional parts is necessary.

LIFETIME DURABILITY . . . Spicer design eliminates contact between the pressure springs and pressure plate — springs won't take a set or lose their pressure due to heat.

ANTI-FRICTION DESIGN . . . Reduced friction, due to knife-edge design of the fulcrum points, reduces pedal pressure . . . provides chatter-free operation in both forward and reverse.

BUILT-IN PARALLELISM . . . Contact surfaces are permanently and accurately parallel. This feature insures uniform pressure around the pressure plate — regardless of wear — and eliminates the possibility of cocking.

OTHER SPICER FEATURES . . . insure smooth pick-up . . . prevent bearing face wear . . . aid fast, easy adjustment. All parts are individually balanced.



CERAMIC TYPE FACING

Latest type ceramic facings offer the following advantages for heavy-duty applications • high coefficient of friction • little or no fade • less pedal effort • longer wear due to high heat resistance.

DANA CORPORATION • Toledo 1, Ohio

DANA Spicer

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

INDUSTRIAL VEHICLES AND EQUIPMENT: Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

AVIATION: Universal Joints, Propeller Shafts, Axles, Gears, Forgings, Stampings.

RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

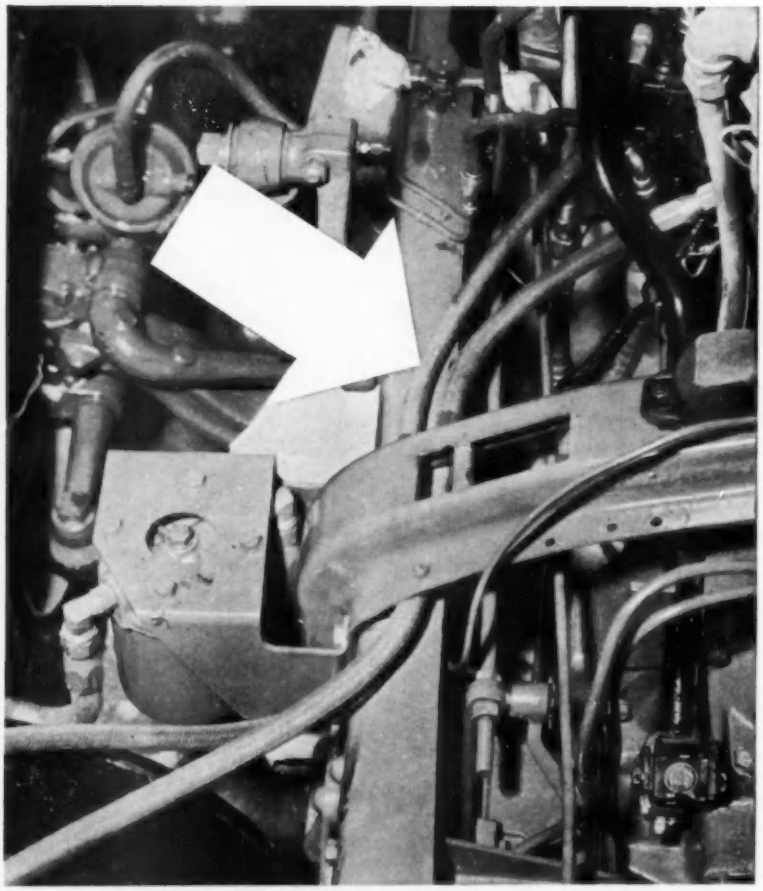
AGRICULTURE: Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

Many of these products manufactured in Canada by Hayes Steel Products Ltd., Merritton, Ont.

R/M TEFLON* hose withstands heat, pressure and vibration in air brake systems

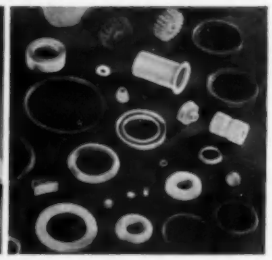
When the air brake compressor is mounted on a truck engine, the line must be guarded against breakage from vibration by a flexible coupling between the compressor and the copper tubing which carries the air to the brake system. Raybestos-Manhattan Wire-Braid Covered "Teflon" Hose is ideal in such a case . . . is specified by leading truck manufacturers because of its unique chemical, electrical and physical characteristics.



"Teflon" is chemically inert . . . immune to corrosion by the new fuels, lubricating oils, and hydraulic fluids. It is flexible and does not expand, contract or fatigue. Low coefficient of friction minimizes pressure drop in fluid systems. It functions in continuous service at temperatures from —100° to +400°F.

R/M has pioneered in exploring many new uses for "Teflon" in automotive and aircraft construction. Our research and testing laboratories and complete manufacturing facilities are yours to command in developing and producing specialized "Teflon" elements for your products.

*A DuPont trademark



Other R/M "Teflon" products of interest to your industry include rods, sheets, tubes and tape; centerless ground rods held to very close tolerances; stress-relieved molded rods and tubes; parts painstakingly machined to your specifications. Our mechanical grade of "Teflon"—Raylon—has many virgin "Teflon" characteristics.

R/M

RAYBESTOS-MANHATTAN, INC.

PLASTIC PRODUCTS DIVISION FACTORIES: MANHEIM, PA.; PARAMOUNT, CALIF.

Contact your nearest R/M district office listed below for more information or write to Plastic Products Division, Raybestos-Manhattan, Inc., Manheim, Pa.

BIRMINGHAM 1 • CHICAGO 31 • CLEVELAND 16 • DALLAS 26 • DENVER 16 • DETROIT 2 • HOUSTON 1 • LOS ANGELES 58 • MINNEAPOLIS 16
NEW ORLEANS 17 • PASSAIC • PHILADELPHIA 3 • PITTSBURGH 22 • SAN FRANCISCO 5 • SEATTLE 4 • PETERBOROUGH, ONTARIO, CANADA

RAYBESTOS-MANHATTAN, INC., Engineered Plastics • Asbestos Textiles • Mechanical Packings • Industrial Rubber • Sintered Metal Products • Rubber Covered Equipment
Abrasive and Diamond Wheels • Brake Linings • Brake Blocks • Clutch Facings • Laundry Pads and Covers • Industrial Adhesives • Bowling Balls

There is no substitute for stainless steel in automobiles

No other material is as bright, strong and resistant to rust and wear as Stainless Steel. It gives every car the clean, exciting beauty that sells in the showroom and re-sells on the used car lot. Look for *Stainless Steel* on your new automobile.

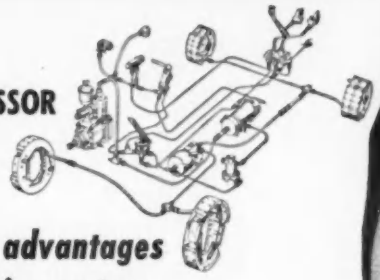
Specify McLouth high quality sheet and strip Stainless Steel. McLouth Steel Corporation, Detroit 17, Michigan.

McLOUTH STAINLESS STEEL

Wagner AIR-OVER-HYDRAULIC Brake Actuation provides safe braking of heavy vehicles that use hydraulic foundation brakes

With the

WAGNER ROTARY AIR COMPRESSOR
...POWER CLUSTER
...FOOT VALVE



You give your customers the advantages of passenger car hydraulic braking systems.

- **SINGLE ACTION BRAKE APPLICATION** (eliminates uncertain two-stage feel)
- **LOW PEDAL OR TREADLE**
- **FAST APPLICATION AND RELEASE OF BRAKING PRESSURE DUE TO HIGH CAPACITY APPLICATION VALVE.**

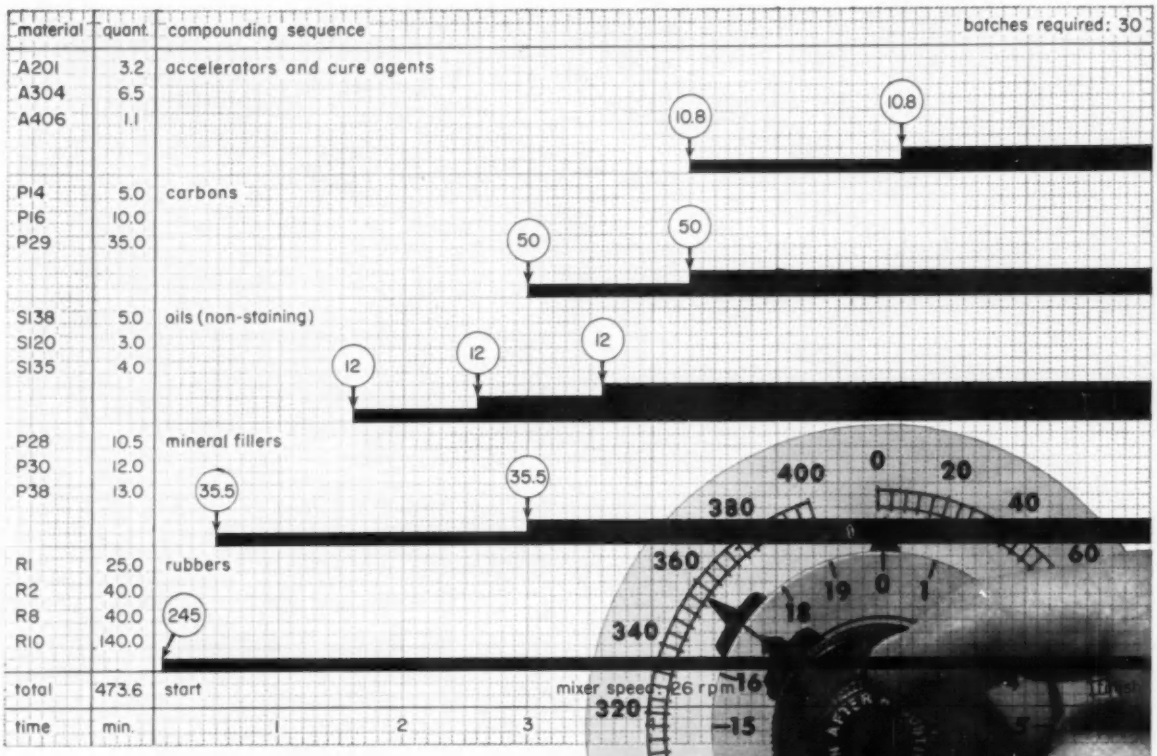
With 35 years of experience in manufacturing braking systems, Wagner is the *only* manufacturer producing *all* of the air and hydraulic components necessary for a complete air-over-hydraulic power brake system. The vehicles you manufacture will be safer when they are equipped with Wagner Air Brake Systems—the systems with the *Rotary* Compressors.

Get the whole story on Wagner Air-Over-Hydraulic Systems—first in economy, reliability and safety.

SEND FOR CATALOG KU-201. It points out the many advantages you gain with Wagner Air-Over-Hydraulic actuation on all your vehicles equipped with hydraulic foundation brakes.

WK-58-4A

Wagner Electric Corporation
6363 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.
(Branches in principal cities in U.S. and in Canada)



Recipe for a perfect batch, electronically compounded!

another example of **ORCO**

CUSTOMEERING

Typical of the advanced techniques at Ohio Rubber is the electronically controlled mixing of rubber and rubber-like compounds. Precise mixing of rubber polymers and compounding ingredients—according to exacting formulas—can be automatically assured at ORCO through electronic control of every step of each batch mixing operation.

Here is just another reason why Ohio Rubber is widely recognized as an outstanding producer of "customeered" parts from rubber, synthetic rubber, silicone rubber, polyurethane and flexible vinyl—whether molded, extruded or bonded to metal.

From components weighing less than a gram to parts of over 73 lbs., complete ORCO facilities for design, production, as well as electronically controlled mixing, are prepared to handle your most exacting rubber and vinyl component requirements. Let ORCO CUSTOMEERING help you with your very next component problem.

Send for free booklet "Component CUSTOMEERING rubber and vinyl parts".

ORCO

THE OHIO RUBBER COMPANY

WILLOUGHBY, OHIO

A DIVISION OF THE EAGLE-PICHER COMPANY

EAGLE EP PICHER

Lowers original equipment costs!
Lowers selling price of truck!
Lowers fuel, maintenance and replacement costs per truck mile!

Lipe DIRECT PRESSURE CLUTCH

Vital component in today's most economical system of power transmission, the Lipe DPB Heavy-Duty Clutch costs less at the start... materially reduces the competitive selling price of the vehicle . . . and affords substantial savings in over-all truck-operating costs per mile.

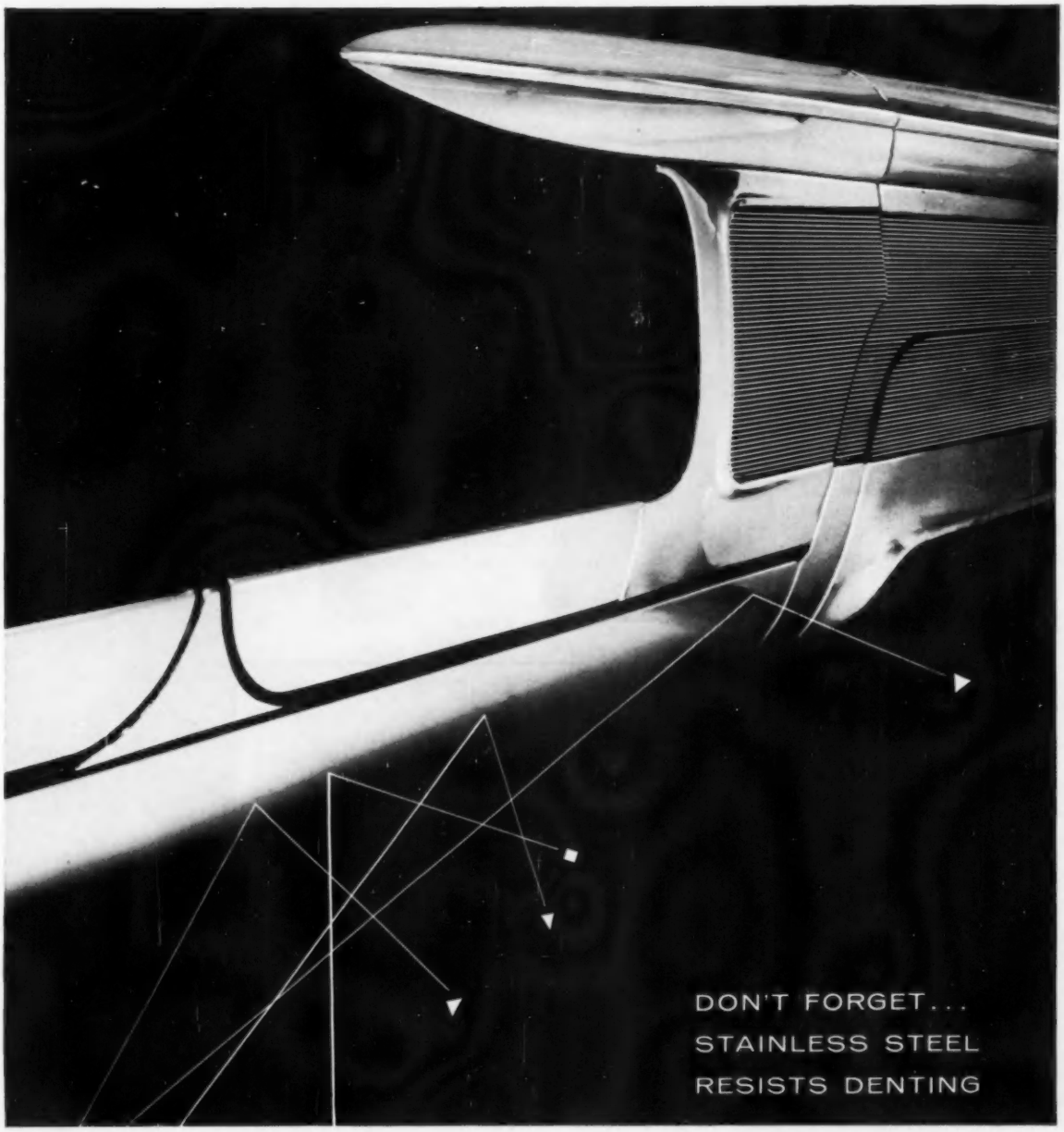
Other elements of the power-train contribute to these savings, but the Lipe DPB Heavy-Duty Clutch absorbs the greatest shocks and fiercest friction, dissipates the most heat, and by its simplicity, direct drive, easy adjustment and replacement-exchange, keeps the vehicle rolling with less cost for fuel, brake relining, oil replenishment and repair. Its worth in highway safety and preventative brake maintenance alone places it far in advance of costlier and more complicated drive components.

Advanced thermodynamic design and positive air circulation add up to a heavy-duty clutch of uncomplicated design with few moving parts. In short, it's a clutch with a low maintenance cost that matches both its low first cost and greatly lower truck-mile costs of operation.

● Lipe DPB clutches now available in 12", 13", 14", 15" single and two plate models. Write for engineering data sheets on the sizes which interest you.

Lipe-ROLLWAY CORPORATION
SYRACUSE 1, N. Y.

MANUFACTURERS OF AUTOMATIC CLUTCHES AND MACHINE TOOLS

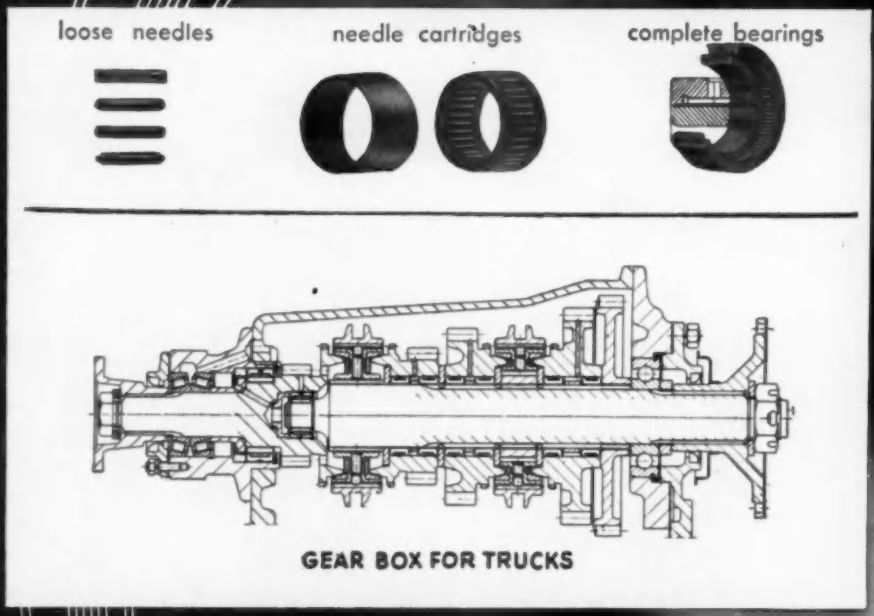


Elementary? Yes, but it's a vital reason why car buyers — a whopping 57 per cent of them — prefer stainless trim. They know stainless beauty is *lasting* beauty . . . it adds to *resale* value, too. Stainless steel resists scratches, road chemicals, corrosion, never peels, comes bright with soap-and-water washing. And the *best* stainless steels are made with Vancoram Ferro Alloys. Your supplier can give you more details about the added value you can build into your autos — with *stainless steel!* Vanadium Corporation of America, 420 Lexington Avenue, New York 17, New York.

Producers of alloys, metals and chemicals

VANADIUM CORPORATION OF AMERICA

Oldest in age
Still in the lead



NADELLA
NEEDLE BEARINGS

133 à 137 BOUL. NATIONAL - RUEIL-MALMAISON (S.-&-O.) FRANCE

New Holley '59 Carburetors can be serviced in minutes— WHILE ON THE ENGINE!

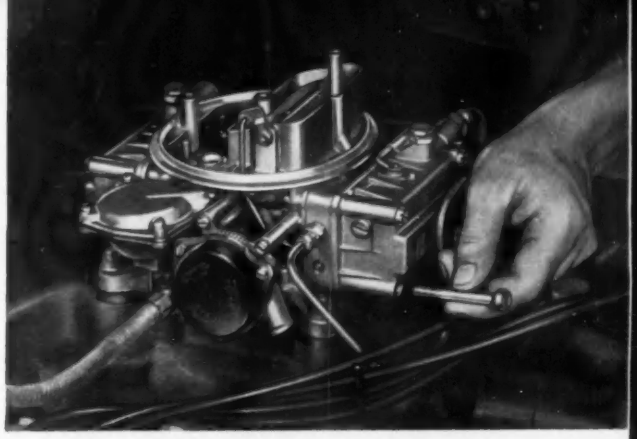
Many 1959 automobiles and trucks will be equipped with newly designed Holley two and four barrel carburetors that have a special needle and seat assembly which makes carburetor service a matter of minutes.

All carburetor minor repair—90% of carburetor service requirements under 30,000 miles—can be completed in the time it takes to remove and replace a single spark plug; and, without removing the carburetor from the engine.

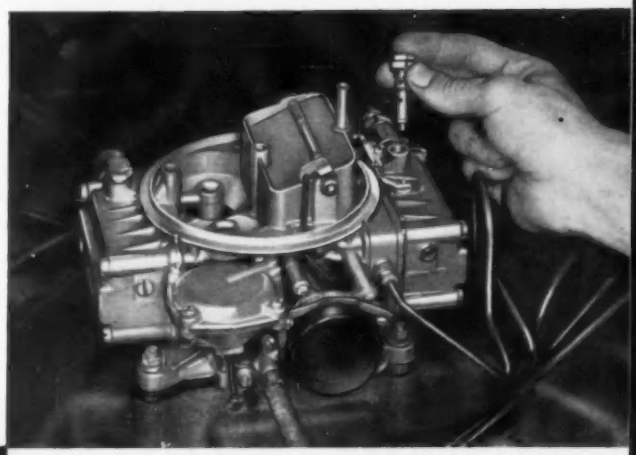
These Holley 1959 models will substantially reduce customer service complaints and will make minor repair work more profitable and more accurate for the service man. With just the four simple steps shown on this page service men can:

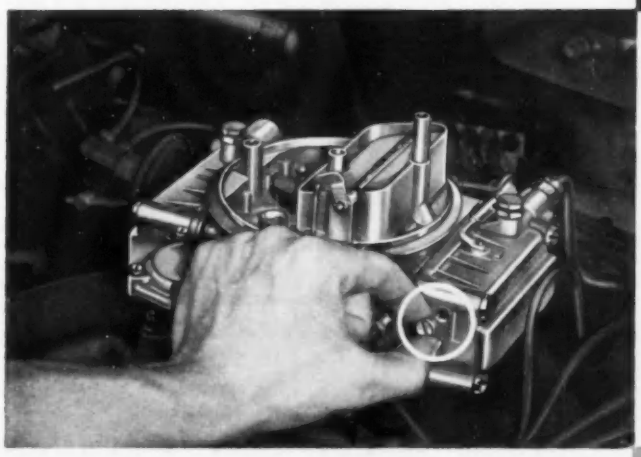
1. Purge the carburetor of dirt and foreign matter.
2. Accurately adjust the fuel level in the bowl.
3. Replace or adjust the fuel inlet needle and seat.

These new 1959 carburetors are another example of Holley's continuing leadership in the design and engineering of fuel and ignition equipment.



1 *With ignition off, remove lower bowl screw farthest from fuel inlet. Allow all gasoline to drain, purging the carburetor of dirt and sludge.*

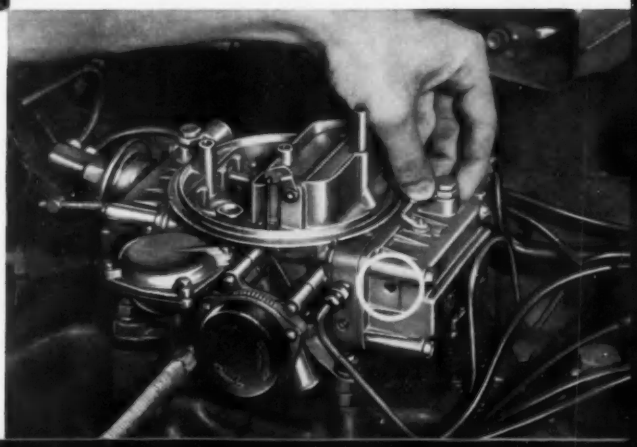




2 *Remove fuel needle and seat and examine for wear and general condition. Replacement can be made at low cost although there should be no evidence of wear until after 20,000 miles.*

3 *With engine running, remove sight plug from carburetor bowl opposite fuel inlet. If fuel level is too high, excessive fuel will drain through sight plug opening. For proper operation, fuel level should be on line with threads at bottom of sight port.*

4 *Loosen top lock nut on needle and seat assembly and adjust with lower nut until float maintains fuel at desired level. Tighten lock nut and minor repair is completed.*



HOLLEY Carburetor Co.

For more than half-a-century — original equipment manufacturers for the automotive industry

11955 E. NINE MILE ROAD • WARREN, MICHIGAN

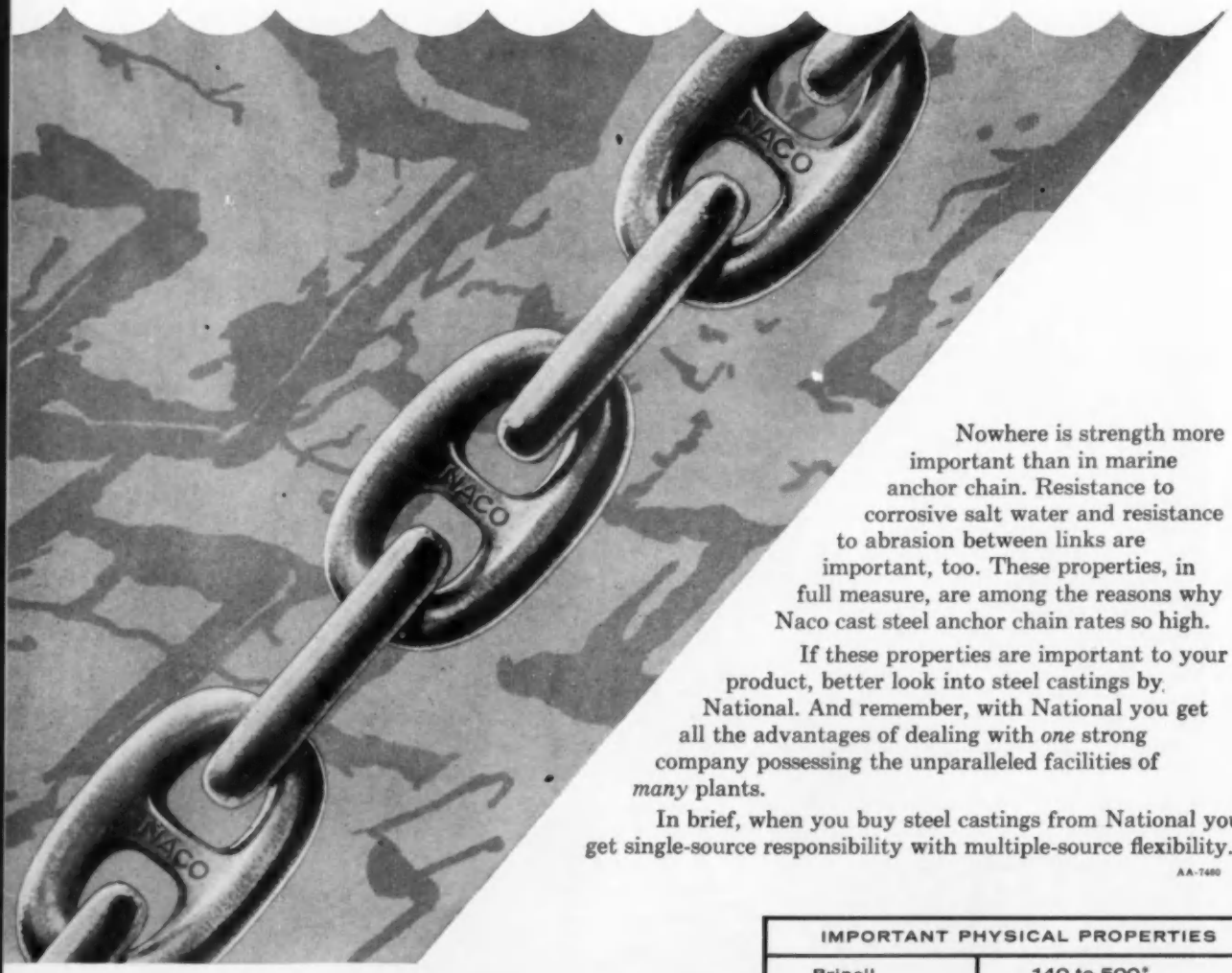
I-29

is your problem

strength?

NATIONAL STEEL CASTINGS

are the answer



Nowhere is strength more important than in marine anchor chain. Resistance to corrosive salt water and resistance to abrasion between links are important, too. These properties, in full measure, are among the reasons why Naco cast steel anchor chain rates so high.

If these properties are important to your product, better look into steel castings by National. And remember, with National you get all the advantages of dealing with *one* strong company possessing the unparalleled facilities of *many* plants.

In brief, when you buy steel castings from National you get single-source responsibility with multiple-source flexibility.

AA-7480

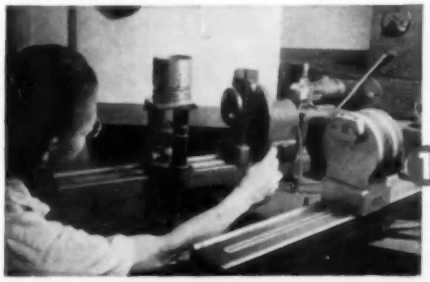
IMPORTANT PHYSICAL PROPERTIES	
Brinell	140 to 500*
Yield, psi	30,000 to 210,000*
Ultimate, psi	60,000 to 240,000*
Elongation, %	24 to 2

*Depending upon grade

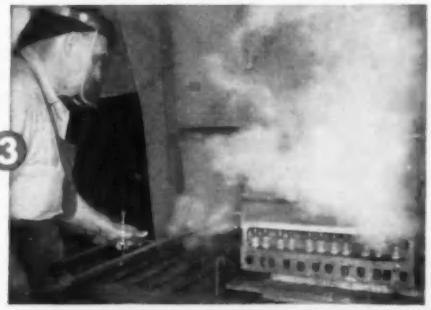
NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

Established 1868 *Cleveland 6, Ohio*

Continental "S" Assemblies Cut Costly Down-Time



Every model in Continental's broad line of transportation engines is now available in "S" Assembly form—basic engine complete with cylinder-and-block assembly, oil pan, cylinder head, piston and valve assemblies, crankshaft, camshaft, gear cover, bearings and caps, crank and cam gears, and front end plate, fully assembled and torqued to specifications, ready to drop under the hood in an absolute minimum of time . . . An "S" Assembly usually costs less than the full overhaul it supplants, but the clinching point in its favor is the saving it effects in costly time out of use. Whether you operate a single unit or a fleet, it will pay you to investigate. Write for information.



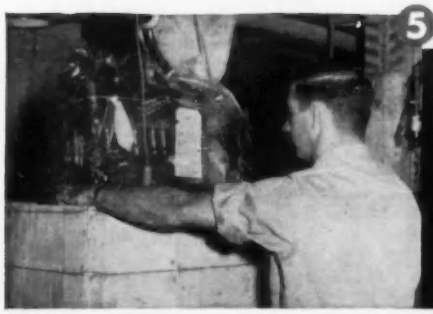
1. *The buyer of a Continental "S" assembly receives full benefit of the advanced practices which maintain quality in new engines. Here spectrographic analysis is used to assure uniformity of quality.*

2. *Here gears are checked to plus-or-minus .0003, on the involute checker, while results are recorded on a continuous chart.*

3. *Live steam under high pressure removes all foreign matter from inside engine block.*

4. *End play is checked, and all lines are oil tested, just as in new engine assembly. Then bearing caps, cylinder heads, gear covers, and filler blocks are all torqued to specifications.*

5. *After final inspection, the "S" assembly is coated with a preservative and encased in a polyethylene bag ready for shipment.*



CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

Continental Motors Corporation

MUSKEGON • MICHIGAN

RING DESIGN

to keep up

with your

engineering progress

For forty-eight years McQuay-Norris has helped automotive designers convert ideas into reality.

For ring design service that always measures up to your needs, call on us.

McQUAY-NORRIS

MANUFACTURING CO. **St. Louis • Toronto**

Largest Producer of Small Rings in the Automotive Industry

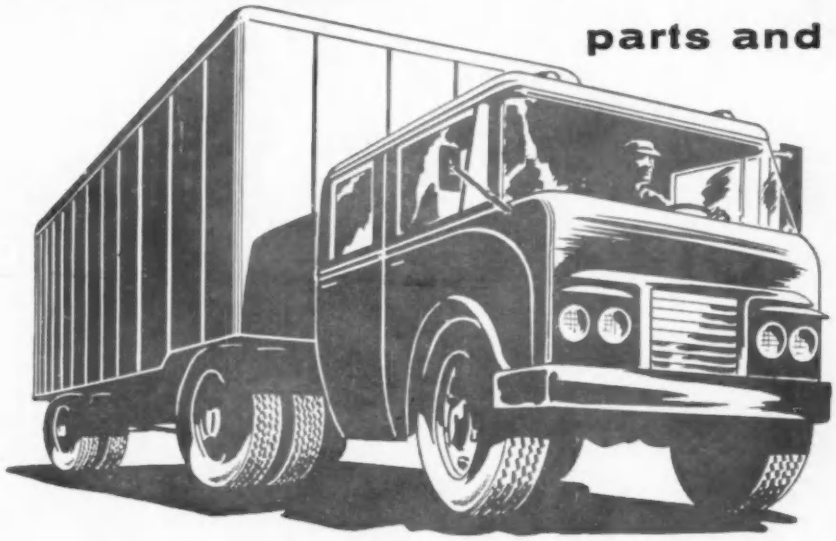
REDUCE TRUCK CAB WEIGHTS as much as 40%

REDUCE TOOLING COSTS 80%

with

MOLDED FIBER GLASS

parts and assemblies



"A pound saved earns a dollar a year," say the trucking companies.

And MOLDED FIBER GLASS parts save pounds and pounds . . . they weigh 40% less than metal parts. That's one reason why so many truck and trailer manufacturers are starting to use MOLDED FIBER GLASS molded pieces and flat sheet for body parts and assemblies . . . from fenders to complete, assembled cabs.

Other important reasons are:

Tooling costs for MOLDED FIBER GLASS parts are 80 to 85% less than for metal;

Time required for tooling is 50% less;

Complete MOLDED FIBER GLASS cabs—as assembled in Molded Fiber Glass Body Company plants—cost little or no more than contoured steel cabs;

MOLDED FIBER GLASS body parts do not rust or corrode . . . do not dent . . . provide sound and temperature insulation;

If and when major damage occurs (which would badly distort metal), MOLDED FIBER GLASS can be easily repaired.

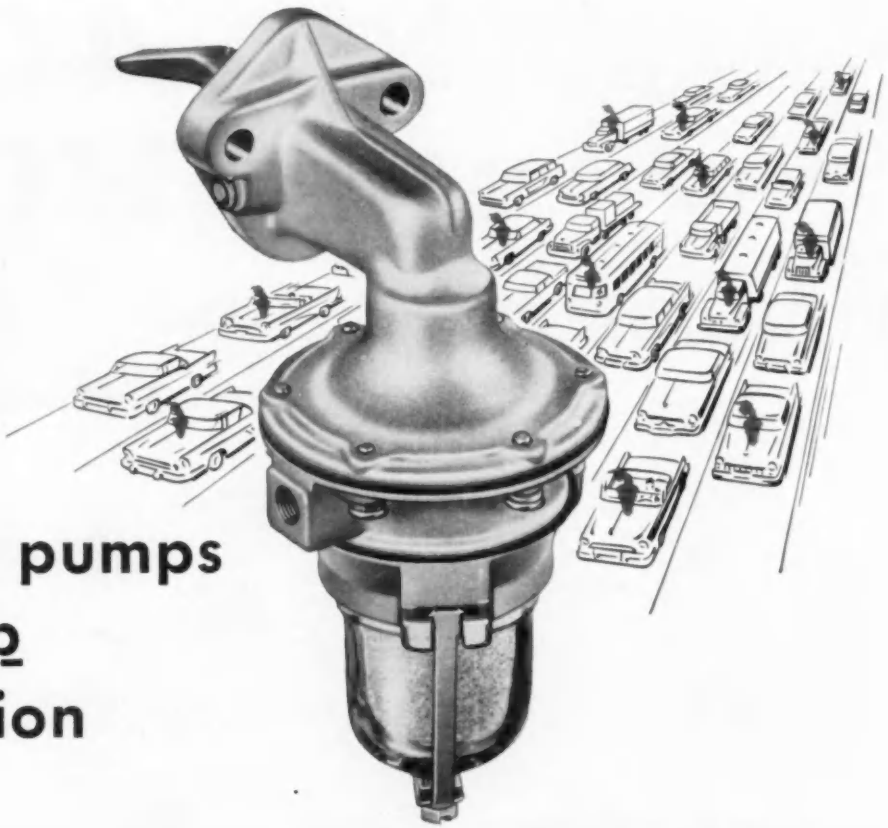
MOLDED FIBER GLASS offers design possibilities not obtainable with metal . . . and MOLDED FIBER GLASS executives are always available to discuss your designs. Just write or telephone for information and literature.

GREATEST NAME MOLDED FIBER GLASS IN REINFORCED PLASTICS

MOLDED FIBER GLASS is the exclusive trade name for fiberglass reinforced plastic products custom molded by the affiliated Molded Fiber Glass Companies.

MOLDED FIBER GLASS BODY COMPANY

4611 BENEFIT AVENUE, ASHTABULA, OHIO



For fuel pumps with top reputation

count on CARTER

MODERN POWER CENTER® FUEL SYSTEMS

Bigger sales ahead two ways! Rugged performance and durability of extra-capacity CARTER Fuel Pumps are recognized more and more by leading automobile manufacturers. And CARTER *pre-sells* your customers through national advertising they remember.

Two sales-motivating reasons why CARTER Fuel Pumps have top reputation... why you'll gain greater customer confidence when you install them. See your Carter Supplier.

CARTER CARBURETOR
DIVISION OF acf INDUSTRIES
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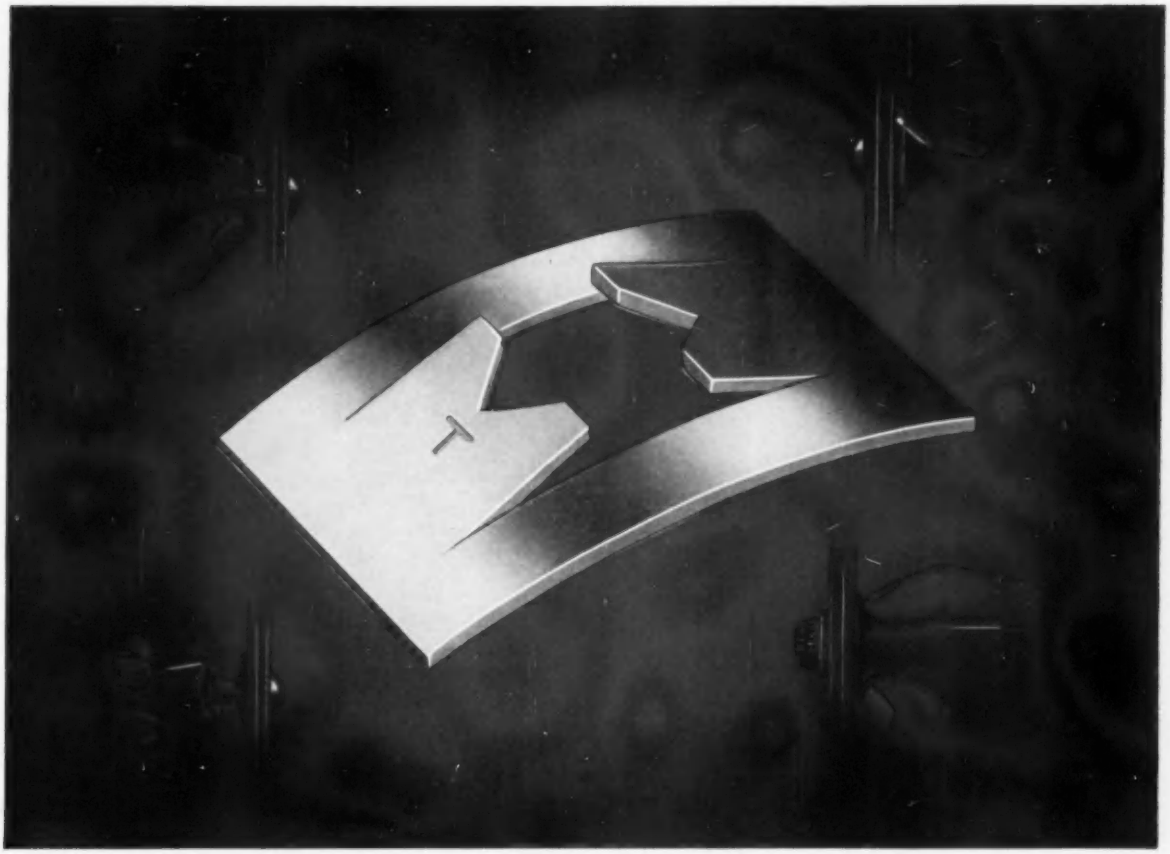
ST. LOUIS 7, MISSOURI



Another Tinnerman Original...

Tinnerman Push-On **SPEED NUTS®** fasten with a "bite" that can't shake loose

In a split-second, this low-cost Tinnerman Push-On SPEED NUT arches its spring-steel back, then bites hard to make a positive attachment on unthreaded studs, rivets, tubing, nails, jewels, small housings.

Application is easy—finger pressure starts it; a push with a simple hand tool locks it under live spring tension. No threads to worry about, no spot welding, no riveting, no special inserts, bushings or washers necessary. Elimination of extra parts and assembly operations may save you up to 50% or more in fastening costs.

Push-On SPEED NUTS lock on everything from thermoplastics to die-cast, chrome-plated steel. Hundreds of variations to fit any shape or size stud —from very small diameters to larger rectangular shapes. Some Push-Ons have "caps" that cover exposed shaft, axle or stud ends.

Check Sweet's Product Design File, section 8-T. Or look under "Fasteners" in the Yellow Pages and call your Tinnerman representative for complete information and samples. Or write to:

TINNERMAN PRODUCTS, INC.
Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

TINNERMAN
Speed Nuts®

FASTEST THING IN FASTENINGS®

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S. A. 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Hucano-Boudy GmbH, Heidelberg.

Hydraulic Impulse Machine "road-tested" Morse Timing Chain and other chains at the equivalent of 95 mph. For results, see below.

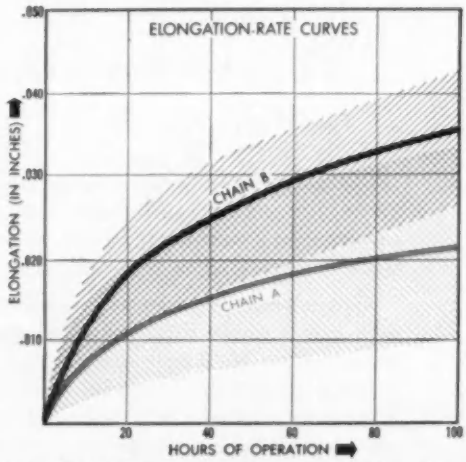
Hundred-hour "stretch test" at 95 mph proves Morse Timing Chain 24% better!

In lab test at 4000 rpm under 90-lb load Morse Timing Chain elongates 24% less than second-best timing chain

The graph at right shows how Morse Timing Chain resists elongation better, even under severest operating conditions. No wonder Morse Timing Chain has been specified for over 80,000,000 car engines.

Today's high-horsepower engines demand split-second timing for top performance. So Morse builds each timing chain like a fine watch; inspects it carefully with modern equipment to insure *extra* thousands of trouble-free miles.

For original equipment or replacement timing chains, it pays to contact Morse *first*. Get full information and practical engineering help. Call, write or wire today: MORSE CHAIN COMPANY, DETROIT, MICHIGAN; ITHACA, NEW YORK. Export Sales: Borg-Warner International, Chicago 3, Illinois.



Morse 53-121 Timing Chain (A) showed 24% less elongation than other chain (B), after 100 hours at 4000 rpm under a 90-lb. load on the Hydraulic Impulse Machine—a very severe test that has been correlated with road and dynamometer test runs.

SERVING THE AUTOMOTIVE INDUSTRY FOR OVER 55 YEARS

MORSE* BW

*Trademark

Geared by FULLER...

Texas Dairy specifies R-96 ROADRANGER® Transmissions

When Milkhouse Cheese Corporation of San Antonio, Texas, purchased new Kenworth tractors recently, the firm specified Cab-Over-Engine Model 825's with Fuller R-96 ROADRANGER Transmissions.

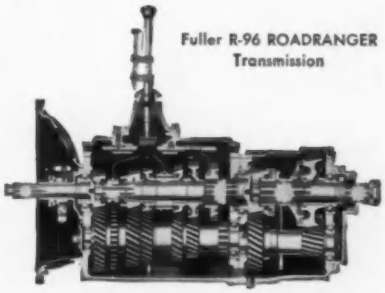
The all-aluminum 73-inch sleeper-cab tractors like the unit shown here, have a chassis weight of 12,790 pounds. Powered with 210 horsepower Cummins NHB diesel engines, these units have a payload capacity of 36,000 pounds.

Lou and Hyman Bernstein, president and vice-president of the firm, respectively, selected these custom-engineered Kenworths, with the 10-speed semi-automatic ROADRANGERS, for long hauls of frozen commodities from the Rio Grande country to the Midwest. These same tractor-trailer combinations haul the Bernsteins' own dairy products from Wisconsin for distribution in Texas.

Fuller ROADRANGER Transmissions give Milkhouse Cheese Corporation:

- **Easier, quicker shifts—28% steps between ratios**
- **One shift lever controls all 10 forward and 2 reverse speeds**
- **No gear splitting—10 selective gear ratios are evenly and progressively spaced**
- **Engines operate in peak hp range with greater fuel economy**
- **Less driver fatigue—½ less shifting**
- **Range shifts pre-selected—automatic and synchronized**
- **Compact space-and-weight-saving economies—the most compact 10-speed transmission available**
- **Transmission weight under the cab—permitting more cargo to be carried on the payload axles**

Get full facts on Fuller ROADRANGER Transmissions from your truck manufacturer or truck dealer now!

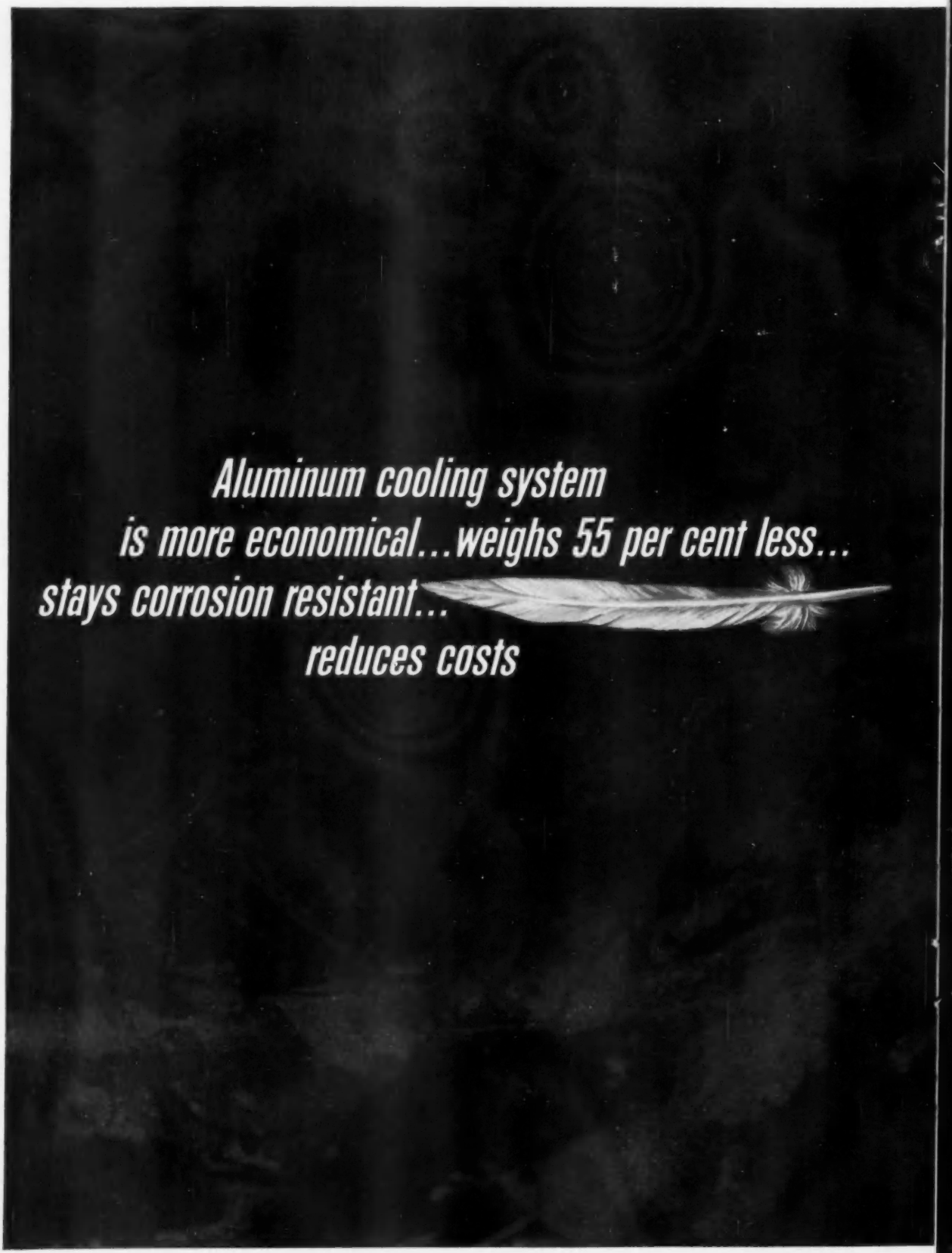


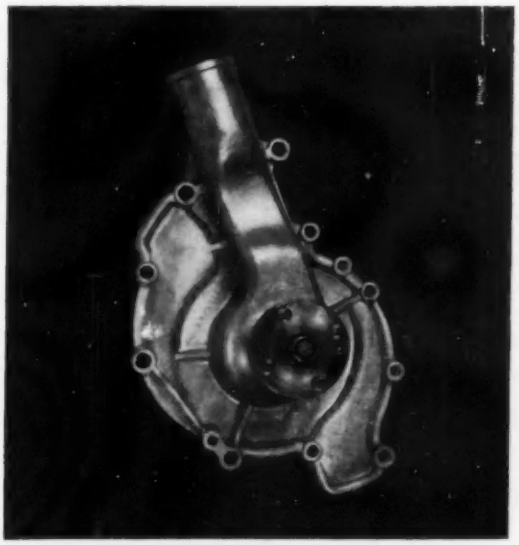
Fuller R-96 ROADRANGER Transmission

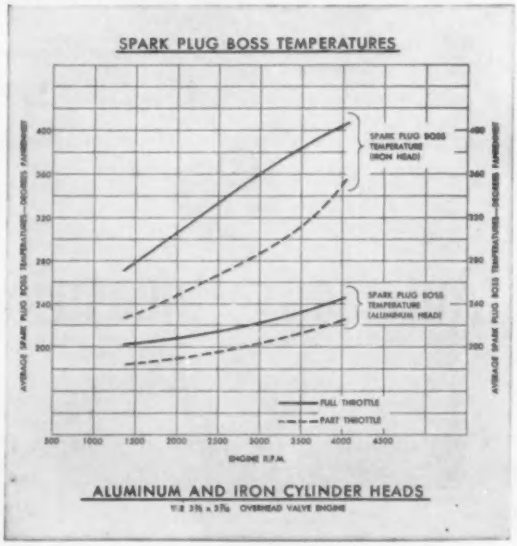
FULLER

TRANSMISSIONS

FULLER MANUFACTURING CO. Transmission Division • Kalamazoo, Mich. Subsidiary, Eaton Manufacturing Company
Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest. Dist. Office, Tulsa 3, Okla.


Aluminum cooling system
is more economical...weighs 55 per cent less...
stays corrosion resistant...
reduces costs





Over 14 years ago, Alcoa's automotive and research engineers focused their efforts on the development of a more efficient cooling system—a cooling system to lick the twin problems of weight and corrosion. Today aluminum cooling system components are a practical reality and foreshadow the all-aluminum system of the future. They point the way to more horsepower per pound, better weight and temperature distribution.

Alcoa Successfully Applies Aluminum in Cylinder Heads, Water Pumps, Heat Exchangers. Through design improvements and alloy development, Alcoa provides weight savings of more than 55 per cent with substantial savings in cost. The aluminum head assembly provides superior heat transfer—valves run cooler and seat better, spark plug boss temperatures are reduced by as much as 165°.

In Service Tests and Field Experience. Alcoa engineers investigated cooling system parts under the most severe conditions. They found that under the usual circumstances no change needed to be made in operating practices. While iron parts need constant protection by corrosion inhibitors, aluminum cooling system components experience comparatively little attack by most coolants. Where applications involve the use of iron and aluminum parts, proper choice of aluminum alloy and design features reduce corrosion and erosion.

Let Alcoa Help. Alcoa's work in the development of the all-aluminum engine and cooling system has resulted in a wealth of accumulated experience in the application of aluminum in the automotive field. Bring your design and application problems to Alcoa. Its engineers and complete facilities are yours to tap. Let us work with you. Write Aluminum Company of America, 1848-J Alcoa Building, Pittsburgh 19, Pennsylvania.

Water pump cover. This die-cast aluminum part, together with the aluminum front cover and pump housing, lends itself to more economical volume production techniques.

An all-aluminum condenser for automobile air-conditioning units. Core weighs seven pounds, depth less than an inch. Aluminum fin stock and rectangular tubes provide lightness, best heat conductivity.

Thermocouple readings taken in Alcoa Process Development Laboratories reveal aluminum's superior thermal conductivity for improved performance. Besides reducing temperature level, aluminum holds temperature range to 60° from part load to maximum horsepower.

ALCOA ALUMINUM GIVES *EVERY* CAR MORE GLEAM AND GO

ALCOA ALUMINUM

Visit Alcoa Booths 46, 47 and 48 during ASBE Convention October 22, 23 and 24.

up to 70% SAVING in assembly cost with HUCKBOLT FASTENERS

check these features:

- High shear and tensile strength.
- Uniform high clinch and preload.
- Positive mechanical lock.
- Excellent sealing qualities.
- Fast, quiet installation.
- Low installed cost.
- Easy removal.
- Your choice of materials and head styles.

Huck fasteners offer you maximum uniform strength, high production, quiet application at advantageously low installed cost. There is a HUCK fastener to fill your need. Write for our condensed Commercial Catalog (No. 8-414) or a HUCK Fastener Consultant will call at your request.

HUCK MANUFACTURING COMPANY
2480 Bellevue Ave • Detroit 7, Mich.
Phone WAlnut 1-6207

Men at Work

in the private offices and in all corners of automotive and aviation industrial manufacturing plants, influence the buying of materials, tools, machinery and equipment. In addition to the buyers whom your own salesmen contact

AUTOMOTIVE INDUSTRIES

reaches men whose names you'll never know—but whose recommendations may mean millions to you.

Also Automotive Industries helps to create and maintain the good reputation of your product in quarters where that help will do the most good.

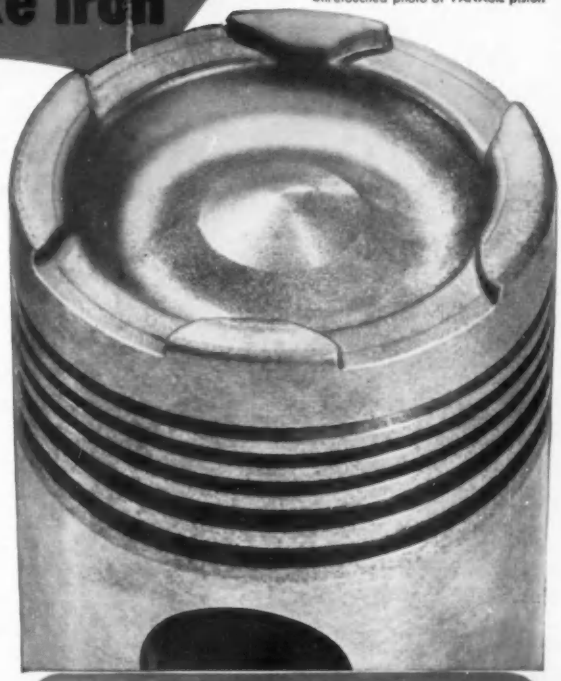
Automotive Industries

A Chilton Publication

Chestnut & 56th Sts. Philadelphia 39, Pa.

as LIGHT as aluminum —WEARS like iron

Unretouched photo of VANASIL piston



MICRO-X VANASIL pistons have run way over 200,000 miles with only *.002"* to *.005"* wear on the top ring grooves. How much wear develops in top ring grooves on the pistons you are using—in 100,000 miles? In 200,000 miles, if they are ever run that far?

On-the-road ring breakdowns caused by badly worn grooves are almost eliminated because *Vanasil Pistons reduce top ring groove wear up to 75%!* Nothing else compares with the genuine G & E Vanasil—the original high silicon aluminum alloy, proven by 19 years of use.

You Get ALL these Advantages only in

VANASIL PISTONS

G & E's proved Vanadium — High Silicon — Aluminum Alloy

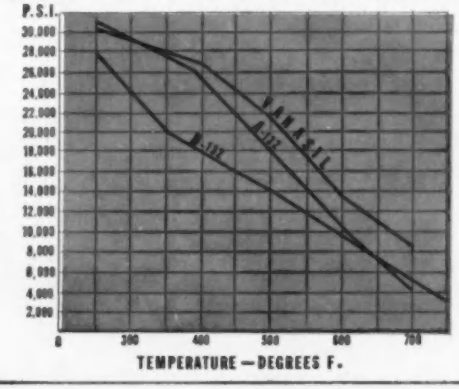
1. **LIGHT WEIGHT**—Same as other aluminum alloys.
2. **SCORING, SCUFFING MINIMIZED**—Because of "Oil-absorbing" microscopic porous texture.
3. **LONGER LIFE — 30% less friction — 30% harder. Greater "hot" strength**—see chart below.
4. **TOP RING**—Breakage virtually eliminated because of reduced ring groove wear.
5. **LOW EXPANSION**—Characteristics of Cast Iron.
6. **CLOSE CLEARANCES**—Fitted with Cast Iron Clearances.
7. **SOLID SKIRT DESIGN**—No expansion devices required.
8. **HIGH HEAT CONDUCTIVITY**—Similar to other aluminum alloys.
9. **GRAIN GROWTH**—None.
10. **PLATING**—No tin or other break-in coating required.

VANASIL Piston Warehouse Stocks:

CALIFORNIA—Automotive & Industrial Whse. Co., 1341 So. Hope St., Los Angeles 15; Piston Supply Warehouse, 2768 Grove St., Oakland 12

NEW YORK—Bethlehem Equipment Co., 109 W. 64th St., New York 23

A COMPARISON OF TENSILE OF VARIOUS ALUMINUM ALLOYS AT ELEVATED TEMPERATURES



MICRO-X VANASIL PISTONS for Gasoline and Diesel Engines

"Gillett & Eaton's trademark for a vanadium-high silicon-aluminum alloy"

GILLETT & EATON, INC. • Est. 1868
841 DOUGHTY ST., LAKE CITY MINNESOTA

SEND COUPON

GILLETT & EATON, INC.
841 Doughty St., Lake City, Minn.

Please send circular and prices on Vanasil Pistons in over 60 types and sizes for gasoline and diesel engines.

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and better work, too...

x-acto®
***surgically-sharp interchangeable blade* KNIVES**

for all cutting, slicing, trimming, slitting jobs!

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Cutting efficiency and safety with a blade shaped to suit your needs. Try-out order! $1.00 for knife handle and sample blade assortment. Catalog of complete knife and blade line on request.
If you have any special requirements for cutting tools, call on us at once. Our half-century of specialized experience is at your disposal.

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A division of X-acto, Inc.
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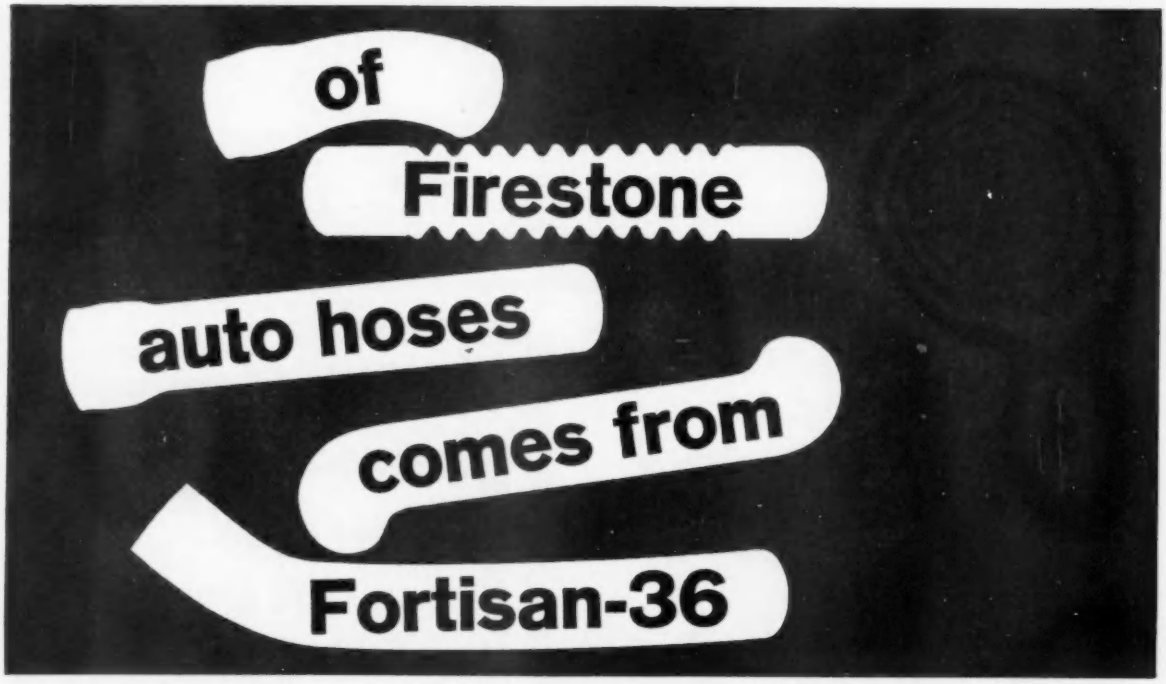
USE THE FINEST!

Specify Vellumoid for the finest in gaskets and gasket sets . . . job matched to your specific requirements. Vellumoid now offers Cylinder Head, Manifold, Exhaust Flange Gaskets and Overhaul Sets to assure trouble-free superior performance.

Ask your jobber about Coppermoid . . . He knows quality.

THE VELLUMOID COMPANY
Worcester, Massachusetts

The strength and SHAPE



Firestone uses Fortisan-36 to shape 21 different radiator hoses. This remarkable reinforcement yarn lets you form and cure hose *easily* to any shape you want.

Fortisan-36's high tensile strength and stability mean better performance at less weight. You get longer life and greater flexibility. Ask Firestone—see how Fortisan-36 rayon takes the woes out of hose.

Celanese Corporation of America, Sales Development Department, Textile Division, Charlotte, North Carolina. Celanese® Fortisan®

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EXPORT SALES: Amcel Co., Inc. and Pan Amcel Co., Inc., 180 Madison Ave., New York 16, N. Y.

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Fortisan-36 ... a Celanese industrial fiber

CLEAR-O-MATIC*

THE "CONTROLLED EXPANSION" PISTON

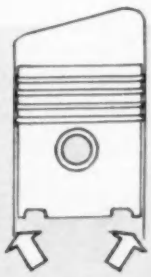
Engineered for COOLER RUNNING

20% Greater Heat Conductivity

GREATER DURABILITY

No Compromise with Strength in Design

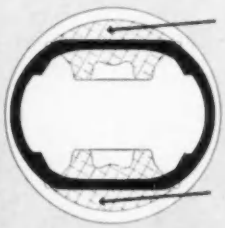
Superiority is outstanding in the Zollner "Clear-O-Matic" Piston. The expertly engineered design of this great piston development incorporates vitally desired performance advantages in addition to the basic Zollner designed expansion control feature. Clear-O-Matic is a remarkably cool piston with greater area of conductivity for heat dissipation. This greater section provides uncompromised strength for long-life durability. No other piston provides Clear-O-Matic advantages. We suggest an immediate test for your engine.



STEEL TENSION MEMBER

Anchored only at pin bosses and cast in positive contact with I.D. of piston skirt.

Automatically maintains uniform effective skirt clearance at all temperatures.



COOL PISTONS

20% greater section for heat conductivity.

DURABILITY

Greater section above pin bosses provides uncompromised strength with long life.

*Design adaptable to full skirted or slipper type pistons for all gasoline engines.

*T.M. Reg. Pat. Apg. for

Advanced Engineering

Precision Production

Cooperation with Engine Builders

ZOLLNER PISTONS

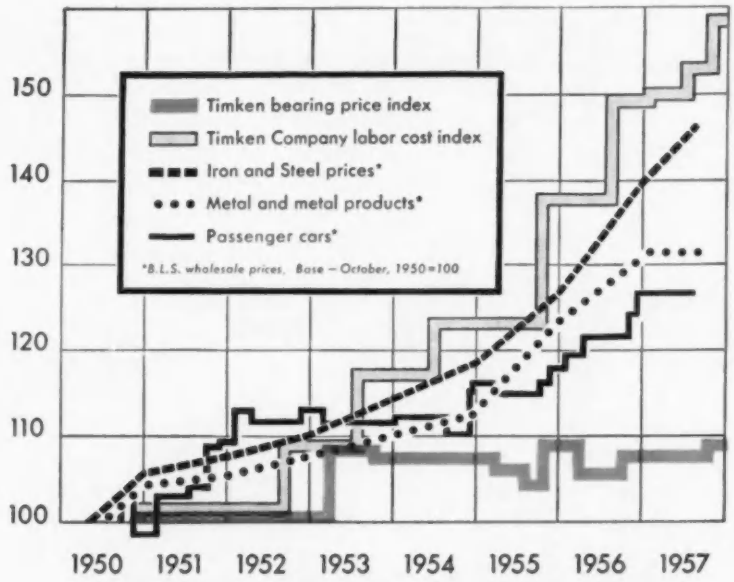
THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

Here's how we've been saving you money

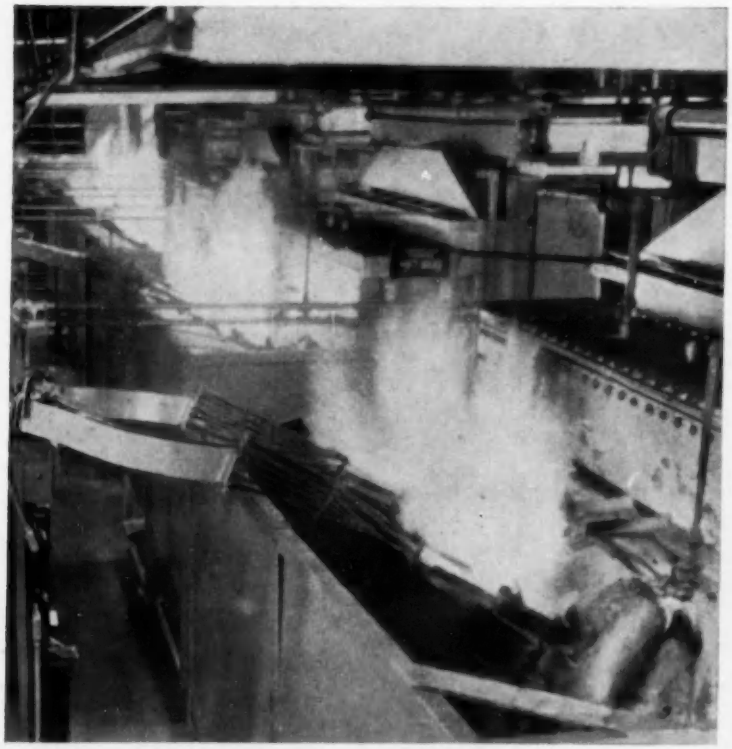
The chart at right shows costs climbing up, up, up. But not the cost of Timken® tapered roller bearings for automobiles. It's stayed down. And the auto industry helped keep it there by standardizing on the new Timken bearing sizes made in a revolutionary new bearing plant—a plant that has everybody talking. (See recent trade articles.)

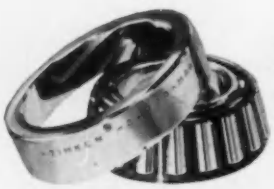


TOTAL VEHICLE COST OF PINION, DIFFERENTIAL, REAR WHEEL AND FRONT WHEEL BEARINGS

Here's how you can keep on saving

Here's part of the unique bearing plant that can turn out 30 million new design Timken bearings a year without a hand touching them. This extraordinary plant can *keep* your bearing costs down if you: 1) standardize on still fewer bearing sizes to help us make even longer production runs; 2) use more Timken bearings and keep cost-saving production going full-tilt. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".





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TIMKEN

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